INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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OUR HOLIDAY GREETING

With conditions as they are, the publishers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION extend to you with more than ordinary warmth the usual wish for a joyful Christmas and a Happy New Year.

Looking backwards over the past months may not be conducive to joyousness nor even hope. Let us look forward then, and with the determination to do all within our power to make others happy, attain that happiness which is bred by our attempts to fill the lives of others with gladness.

May the passing days of the year 1932 see every one of our readers approach nearer and nearer to the ma-

May the passing days of the year 1933 see every one have engendered.

THIS MONTH'S COVER

Our cover picture this month shows the drawing room of a wire mill.

After the steel has been rolled out to about 3/16 in. in diameter, the actual wire drawing process commences. From here on the drawing is done while the metal is cold. Each draw produces a wire of a smaller size so that if very thin wire is to be drawn, a large number of draws through holes of ever-decreasing size in dies that are almost diamond-hard must be made. Each draw makes the wire harder so that if a large number of draws are to be made the bundles of partially drawn wires must be again and again annealed to prevent the metal from becoming too brittle.

Photo courtesy American Steel and Wire Company, Chicago, Ill.

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The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Philippine Education Co., Manila, P. I.

To the members of the A. V. A.

We offer our congratulations to the officers and other members of the American Vocational Association responsible for the efficient organization of the Kansas City Convention and, also, to those members who by their presence contributed to its brilliance and success.

We are thankful for the privilege accorded us of participating as exhibitors at this convention and of cooperating with others in the display of merchandise, machinery, books, etc., which held the interest of those in attendance because of the value of these exhibits to vocational education.

We are highly gratified with the instant recognition and appreciation of our efforts, to build a unit group of machines suitable for the school shop within the price reach of all communities, shown by the many members of your Association who visited our booth. Such appreciation encourages us to maintain the leadership gained in presenting this new line of school machines.

We shall be glad to furnish illustrations and complete specifications of these machines to those of your members who are interested.

YATES-AMERICAN MACHINE CO.
Beloit, Wisconsin

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

January, 1933
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Spanish Renaissance Furniture

J. I. Sowers

Director of Industrial Education
Miami, Florida

The beauty of this type of furniture makes it a worthy project for school shops.

THE purpose of this article is to direct the attention of industrial-arts teachers to the possibilities of Spanish Renaissance style furniture in school-shop work. This period style, running back as it does to Byzantine and Moorish types, presents a range of work from the most simple up to the very elaborate and ornate. Some of the pieces shown in connection with this article are less difficult than William and Mary, Queen Anne, Chippendale, Hepplewhite, Sheraton, Empire, or even Colonial reproductions. Great interest can be stimulated in advanced cabinetwork by the making of fine pieces modeled after the various period styles, and the Spanish Renaissance style deserves that more attention be given to its many fine, yet not too difficult, designs. The present desire for something radically different in design and color, also makes the Spanish a particularly desirable type.

Fig. 3. A Spanish type dining table

Many outside influences such as Roman, Byzantine, Italian, Gothic, and French are shown in Spanish furniture. The native Moorish element, however, always serves to distinguish the Spanish from all others. The Moors were Mohammedans who invaded Spain early in the eighth century. Spain was at one time the frontier of Roman culture. Moors coming through Africa into Spain were not finally driven out until 1492, the year of the discovery of America. Spanish art and architecture reflect the age-long struggle when Spain stood as the barrier protecting the rest of eastern Europe against the advance of Moslem power. The Moors excelled in iron and leather work, and used both of these materials in the construction and ornamentation of their furniture. The leather work is often carved in intricate design and sometimes painted in the primary colors. An instance of carved (not tooled) leather work is shown in Figure 1. The use of iron work as a part of furniture construction is shown in the tables illustrated in Figures 2 and 3.

Spanish Renaissance is a style of rich dignity, and good workmanship, interesting through restrained decoration. Carving, when used, is neither massive nor

extensive. It always is cut into the wood (see Figs. 4, 5, and 7) never applied. The woods used are solid, never veneered. There are some rather rare examples of inlaying with bone, brass, silver, etc., but contrasting wood inlays were not used. The woods used for reproductions are usually mahoganies and oaks. They are finished with stain, oil, and wax, not with varnish or shellac. The color chosen is usually dark walnut stain which may be used on both mahogany and oak to give the appearance of age. Sometimes an application of rottenstone is used in the pores of the wood to give an antique effect.

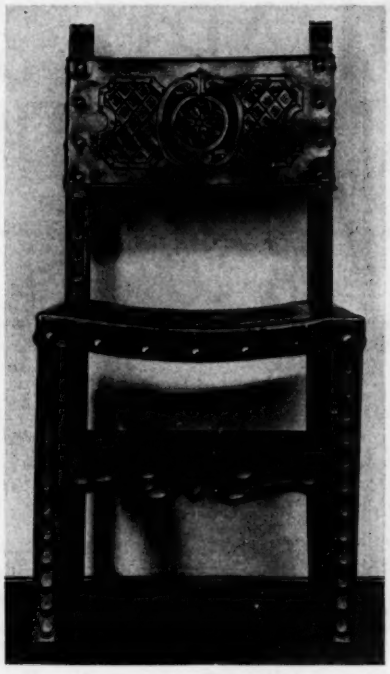


Fig. 1. A Spanish chair with carved leather seat and back

Fig. 5. A carved Spanish chair with seat supported only from sides. Note shell pattern carving on leg

Although some curved lines are used to furnish contrast, they are short and the general effect is rectangular. Legs of chairs and tables are (1) straight, rectangular, grooved or carved; (2) straight, baluster, or spiral turned; (3) scroll, combined scroll, and turning. Examples of these are shown in Figures 1, 2, 3, 4, and 5. Spanish chairs are never upholstered in the sense of being stuffed and supported by springs. The material of the seats and backs is usually full heavy leather which is tightly drawn over the framework, and fastened with large wrought or brass nails. The seats are sometimes slightly dipped, or permitted to hang, hammocklike, between the two side supports, as shown in Figure 5. The two small chairs shown in Figures 1 and 5 are dining chairs, while the larger chair shown in Figure 4 is a rather elaborate hall chair.

It will be noted that in Spanish chairs the front stretcher is unusually wide and elaborately decorated. Stretchers in both Spanish chairs and tables are shaped on the underside.

The two tables shown give a fair idea of the Spanish type of table of the Renaissance period. They are somewhat similar to trestle tables. The legs are splayed

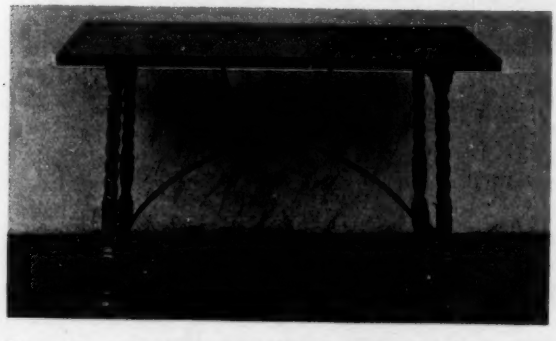
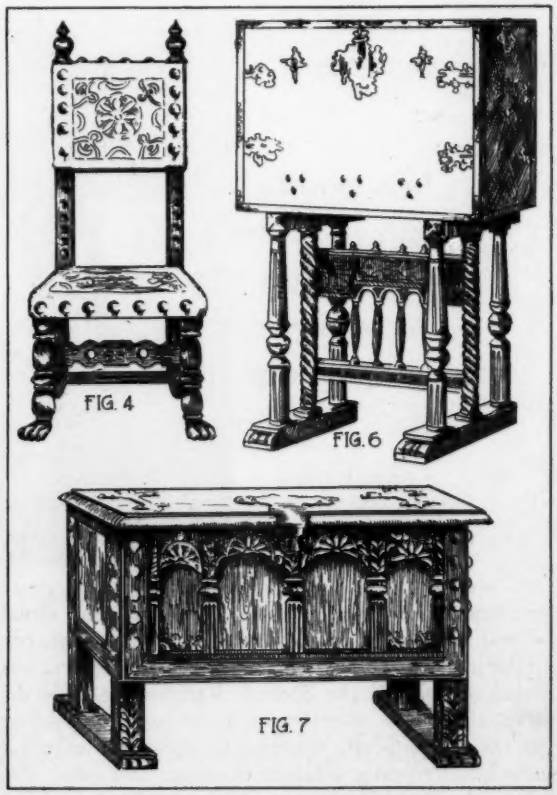


Fig. 2. A Spanish type console table



Figs. 4 and 7. Spanish Renaissance Designs
Fig. 6. The Vargueno — A Spanish Type Writing Desk

both ways, and mortised into a crossbeam which is, in turn, often housed into the top of the table. The legs are held together by iron scroll work, as is shown in both of the tables illustrated. The larger table shown in Figure 3 is a 34 by 72-in. Spanish dining table. In order to give better support, side rails were built into this table. This is not typically Spanish, but they were kept narrow, and they were made to extend beyond the legs so as not to destroy the trestle-support effect. The small table shown in Figure 2 is 21 by 46 in. A dining table of the Spanish style fits particularly well into a modern house designed without a dining room. It is not unlike a large library, or den table, yet it is large enough to serve as a dining table. The long overhung ends of the top are also characteristically Spanish.

The sketch of the Vargueno shows a boxlike writing cabinet or secretary. It was developed from a Moorish cabinet of small drawers, set upon a stand. The arched colonnade which connects the two ends of the support is much used in the better style of Spanish furniture. It is found in the heads of beds, backs of chairs, etc.

The Spanish chest (Fig. 7) properly made is at once useful, convenient, and beautiful. It is built usually about a foot from the floor, making it easy of access.

Carving, when used on Spanish furniture, is typically Moorish in design. Mohammed taught his followers not to make images of any living thing to prevent idolatry, hence all Moorish carvings show an intermingling of geometrical and conventional designs. The carving is used sparingly and never covers the whole surface as is often done in furniture of the Louis XV period. Neither is it as elaborate as that of the Italian Renaissance, which it somewhat resembles. The carving shown on the front of the turned chair leg in Figure 5 is a shell pattern of Byzantine design and is much used on Spanish furniture. This design is easy enough for even a junior-high-school boy to execute.

It is hoped that this article will awaken more interest in the making of Spanish Renaissance furniture in school shops. Not only will it add dignity to the product produced, but it will cause the students to be more interested in their work.

A Portable Puppet Stage

John G. Kemper

Bremen, Ohio

The marionette show is becoming popular again. This article therefore is timely.

FOR those interested in puppets or marionettes, the portable and collapsible stage described herewith will be a source of great pleasure and satisfaction. Such a stage affords hours of instructive entertainment for children, and may be used in the home, the school, or in other public places for presenting puppet plays. It gives children an opportunity for self-expression and develops their creative powers. For those who have not yet come under the spell of the miniature theater, this project will afford a new and intensely interesting experience. Educators throughout the country are realizing more and more the value of marionette plays for training children; likewise, more and more adults are becoming interested in the revival of the ancient art of puppetry. Hence the value of this easily built and inexpensive movable and collapsible stage which can be made at a cost not to exceed three or four dollars.

The stage consists of three panels lashed together to form a three-piece screen, the center panel containing the stage proper; the upper part of the center panel and the two side panels are for the purpose of concealing the operators from the audience. Figure 1 shows how the stage appears to the audience, while Figure 2 represents a view "backstage." The first step in making the stage is the construction of the panel frames. Pine lumber (about ¾ by 1¾ in.) is needed as follows: 8 pieces, 4 ft. long; 6 pieces, 6 ft. long; 2 pieces, 3 ft. long. Three frames, like the one shown in Figure 3, are built. The piece marked A is placed in only one of them, and is located 12 in. from the bottom of the panel. It is fastened in place with thin sheet-metal plates, BB. These plates are 1½ by 3 in. Use angle irons and corrugated fasteners to join the pieces of the frames together.

To the panel frame to which piece A was added, fasten strong pieces of thin wire, as indicated by the dotted lines in Figure 3. They should be stretched as tight as possible, and should be flush with one side of the frame. It is well to

Fig. 1 shows how the Stage appears to the Audience,.. while Fig. 2 represents a View "Backstage"

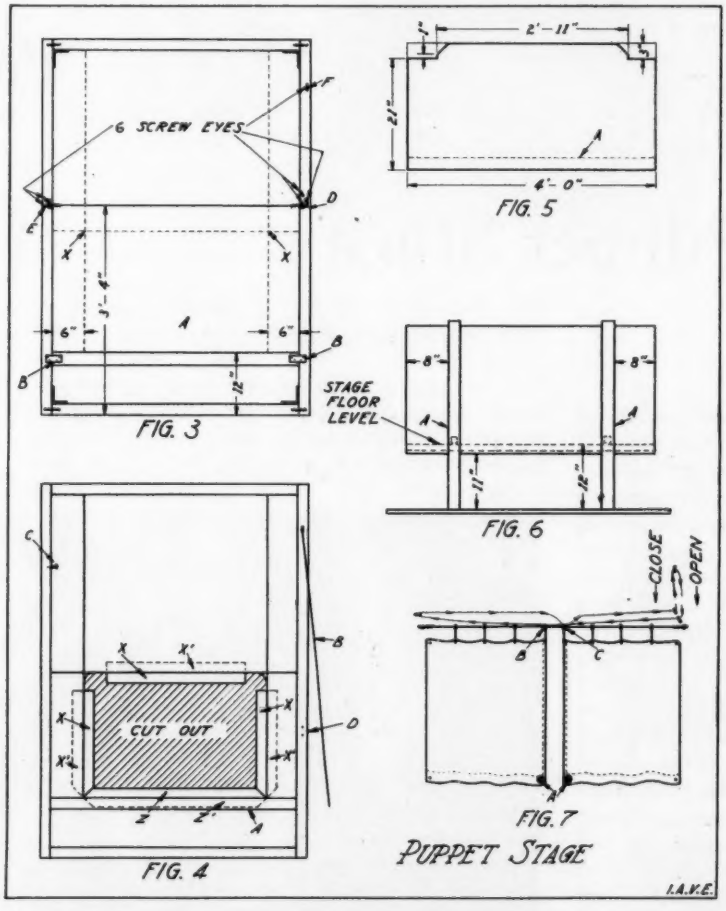
tie the intersections *xx* together very firmly. Next, stretch a piece of 18-gauge copper wire tightly between two ⅝-in. screw eyes DE, Figure 3. This wire should be 40 in. from the bottom of the panel and on the side opposite that to which the wires, shown dotted in Figure 3, have been fastened. On this same side, two more screw eyes are placed above eye D, and one above E, as shown in Figure 3. The stage-curtain cord, which will be discussed later, passes through these as well as through screw eye F, placed 9 in. from the top of the frame. Next, the three panel frames should be covered with tightly stretched unbleached muslin. In order to make a neat panel, it is better to pull the cloth around the edges of the frame and tack it down on the back side; in the case of the center panel the tacking would be done on the side on which the screw eyes have been placed, causing the cloth to lie directly against the cord or wire which is on the opposite side of the frame. After this is done the stage opening is cut leaving flaps (*x*, *x*, *x*, Fig. 4) one or two inches wide. These flaps are then carefully folded over the wire and fastened down with *waterproof* cement (see *x'* *x'*, *x'*, Fig. 4). Duco household cement is good for this purpose. It will be noted that if one wishes the upper corners of the opening to be rounded, there are no flaps along the curved portions. Flap Z is to be pulled tightly over the wood piece A and firmly tacked as shown at Z', Figure 4. Although flap Z should be pulled tight before fastening, flaps *x*, *x*, *x* should not, as this would curve the cord or wire and the sides and the top of the opening would be arched instead of straight.

Provision for lashing the three panels together is made by securely fastening a 4½-ft. piece of heavy twine B to the right side of the center panel frame, 8 in. from the top. Two 1½-in. nails are partly driven into the frame, 24 and 25 in. from the bottom of the frame, on the same side as is the cord (see D, Fig. 4). Another nail is driven in the left side of the frame 16 in. from the top, as shown at C, Figure 4. The panel that fastens to the left of the center panel is equipped with a cord and two nails, the same as on the center panel, and on the same (right) side. The right panel is prepared with a nail on the left side the same as nail C on the center panel. Thus, by hooking the cord over the nails C on the adjoining panels and then by tightly drawing and wrapping the end of the cord about the two nails provided for each, the three panels are joined together quickly and easily. They are made to stand firmly by turning the side panels sufficiently forward or backward.

The last step in preparing the panels is to calcimine them in order to make the cloth lightproof. Several coats should be applied to both sides of all three panels; 2½ or 3 lb. of calcimine powder will be sufficient to do this — any color may be used. The calcimine may be applied with an ordinary paint brush.

Next make the stage floor and the cyclorama (the back of the stage). Both parts may be made of wall board, the stage floor being cut as shown in Figure 5. The cyclorama is merely a 2 by 4-ft. rectangular piece. The two 3-ft. pieces of lumber are nailed to the back of the cyclorama 8 in. from either end, as shown in Figure 6. The remaining piece of wood (4 ft. long) is fastened along the back edge (underside) of the stage floor, as shown at A in Figure 5. The stage floor is now fastened with two hinges (A, A, Fig. 6) to the cyclorama so that the stage floor, when level, is 12 in. from the floor, as indicated in Figure 6. The hinges allow the stage floor to fold, booklike, flat against the cyclorama when it is not in use. When set up, the 3-in. projection of the stage floor comes through the stage opening and rests upon the wooden support A, Figure 3. Thus, after standing and joining the three panels, the stage-floor cyclorama piece is stood with the cyclorama in a vertical position with the stage floor resting horizontally upon the center panel.

Next, the stage curtain has to be put on. First, a teaser, or valancelike strip, should be hung across the top of the stage opening, on the back side. It should be 4 ft. long and 6 in. wide, the ends being tacked securely to the wooden frame; about 4½ in. should be visible from the front side, as shown in Figure 1. The curtain is made of two pieces, each 32 in. wide and 26 in. high. The material used for both the teaser and the curtain should be reasonably light in weight and lightproof, and should be of a color that harmonizes with that of the panels. The two curtain pieces are hung from the wire (C, Fig. 3) by small wire hooks or rings that slide freely upon the wire. The outer side (i.e., away from the center of the stage) of the curtain pieces are tacked to the wood frame. It is well to put small weights in the inner lower corners of the curtain pieces as shown at A, Figure 7. The bottom of the curtain should be about 1 in. from the support for the stage floor. The cord used to open and close the curtain should be of strong linen in order that it will not wear and break due to friction. Figure 7 shows schemat-



ically how this cord is to be installed. It is first run through the four small screw eyes previously provided and then fastened to rings B and C as shown. These fastenings should be carefully made in order that any slipping of the cord will be impossible. The vertical portion of the curtain cord along the side of the frame provides a place from which to operate the curtain by pulling up or down. If, when the curtain is closed, it gapes open at the bottom, it can be remedied by tying a cord to the center of the curtain wire and fastening it to the top of the frame, drawing it up sufficiently to remove the sag from the wire and hence bring the curtain closed at the bottom.

This completes the marionette or puppet stage at a minimum expense. If one wishes to invest more in the project, the following changes — and, of course, improvements — are suggested: Instead of calcimine-covered unbleached muslin for the frames, canvas might be used. Or, better yet, the panels might be made of light-weight wall board. It is suggested that two reinforcing boards (18 in. long) be nailed from front to back on the underside of the stage floor to prevent any sagging which might, in time, occur. The stage floor may be painted any neutral floor color. Several wire screw hooks (about 1¾ in. long) placed at the tops of the frames on the side panels afford places to hang the marionettes when they are not in use. The cyclorama may be painted any color desired, although, if a sky effect is desired for outdoor scenes, a deep sky blue is suggested. Dull-finish paint, such as poster paint, should be used. An effective proscenium arch may be painted about the stage opening, and the panels may be decorated according to the tastes and inclinations of the maker. When the marionette stage is not in use, the two plain panels may be lashed together and used as a screen for displaying drawings, maps, charts, bulletins, etc., in the classroom. The stage may also be used for building model stage sets which are to be carried out on a large scale for "regular" dramatic productions. In this connection, as well as for the marionette plays, miniature footlights and border lights may be made by using strings of Christmas-tree lights. Reflector cases for these may be made of corrugated cardboard or of sheet metal. It is well to use white or colorless bulbs entirely. Color effects may be produced by placing little pieces of colored gelatin sheets in front of the white lights. Floodlights may also be similarly made, using 25- or 40-watt Mazda lamps. Scenery for the stage may be made out of cardboard boxes and corrugated cardboard, painting it with poster paints. Countless ideas will develop as the building of this practical little stage is started, and numerous interesting and helpful addition may be devised and added.

Selecting the Right Project

Lyle M. Garnett

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The factors which enter into the selection of school-shop projects.

ONE of the things that confronts the woodworking teacher is the selection of suitable problems. The teacher in a part-time vocational school finds this doubly hard because he usually meets his students only one day a week. Many of these teachers wonder why there should be such a waning of interest on the part of the boy when so much of the teacher's time and effort has gone into the planning of a project. Perhaps hours have been spent helping a boy plan a cedar chest, a writing desk, or a radio cabinet. The boy starts with great enthusiasm, but before the project is ready to be assembled, his eagerness has practically disappeared. What was once an industrious student has now become an irritating problem. Try as hard as the teacher may, he frequently finds it impossible to get the student to properly finish the job.

The reason for this sudden loss of interest may be found in the fact that the project was too large, and that it took too much time to complete it. A project that did not seem very large at the beginning has stretched out over several months with the result that the student finally comes to the conclusion that he is not adapted to be a woodworker, and decides to quit and take up some other line of work.

Had this student been encouraged to make several smaller pieces of furniture instead of the large one, he would have learned just as much about cabinet-making, and it is most probable that he would not have lost his interest in the work. The student who completes a new project every few weeks feels that he is successful in the work and his interest will be kept at a white heat all of the time. Of course, not all students are so affected, but most of them are.

Another big problem that confronts the vocational-school teacher is to determine what have been the experiences of the student before he enters the vocational-school shop. Some of the boys have progressed considerably while others may not have had any woodwork experiences at all.

A small picture frame where the boy is required to make up all of the moldings for the frame himself, forms a very good test problem. This little simple frame enables the teacher to watch the boy at work and thus determine whether the boy has told the truth about his previous experiences.

In making this picture frame, the boy should be required to do all of the work by hand, and, if possible, should make a frame for some picture or diploma he may own. The moldings should be of the simple rabbetted type that do not require the use of the 55 plane or the shaper. An analysis of this project shows that the student must use the jack plane, the rabbet, plane, marking gauge, rule, try-square, rip saw, miter box, hammer, and nails. This gives the teacher a pretty good chance to find out what the boy knows about handling the common tools.

Another simple project that requires the student to perform the squaring processes should follow. A pair of book ends, boudoir lamp, recipe box, or a toy

cedar chest may be used for this purpose. The boy who has shown some ability may be allowed to make either the recipe box or the small cedar chest, because these will require him to perform the squaring exercises, make several pieces to the same dimensions, make rabbetted joints, and in other ways prove his ability. The teacher should not be too hasty in allowing the student to use any of the machinery with which the shop may be equipped. Some boys may say that they know all about the running of the machines because they have worked on them in some other school, but each boy should be made to prove his ability first before he is permitted to use any of the machinery. Safety is the one thing that the teacher of woodworking must have in mind at all times.

The few simple projects just mentioned should not take the boy more than five or six class periods, by which time the teacher should be able to differentiate between those responsible enough to be allowed to use the machinery and those who are irresponsible. Each boy should then be allowed to choose some project that he wants to make out of a set of two or more projects which all involve the same cabinet process. Not all of them will have use for the same thing, but all should get the same training in cabinet practices. Each time that the boy meets with a joint or a new experience that he has not previously had, he should be required to do that job by hand. When he thoroughly understands the hand operation, it is a simple matter for him to learn how to do it on the machines.

A set of two or three colonial wall shelves make good projects, to start the boy using machinery. The shelves may be so designed that the boards are long enough to be safely run across the jointer. The first time the boy uses the jointer, give him a little individual attention. Don't just take his word for it that he knows how to run the machine. Allow him to make the long cuts on the jointer, and possibly do any rabbetting that is necessary. The boy should set up the machine himself and then have the instructor check the setting before the power is turned on. Some of the boys may resent this cautious policy at first, but it teaches them to be sure that the machine is properly adjusted before any work is begun. It also will keep accidents down to a minimum, and there is no doubt that it will teach the student to be more cautious later on when he enters industry.

A group of four or five well-designed magazine baskets also will make a group of projects which holds a great deal of boy interest. In this project the student may be taught how to make glue joints on the jointer, how to cut the grooves for the sides and center partitions on the circular saw or with a small router that is electrically driven. The end pieces should be either mortised or doweled into the shoe.

Following this group should be another group of projects that all have the same cabinet practices in their make-up. Such a group may include a sewing table, night stand or taboret, or a footstool frame. These might have a Queen Anne leg on them thus giving the boy the experience of sawing out this type of leg. The aprons may be mitered together at the corners and the points held together with the use of some of the commercial fastenings used in industry such as clamp nails or corrugated fasteners. The legs may be doweled to the apron. The sewing table may be made just like the other projects except that a bottom may be added and the top hinged instead of fastened down solid. A simple molding may be cut on the edges of the tops with a 55 plane or with a shaper.

A course in wood turning may be developed in the same way by having several different groups of projects, each of which involves the same turning processes.

When the student has mastered the wood-turning lathe to the extent that he can turn out several duplicate parts, he may then be introduced to a group of projects including a Priscilla sewing cabinet, end tables, book troughs, etc. These projects would very likely include many of the processes that the boy has already covered, but they would also include some new experiences.

Job sheets or instruction units should be prepared for each of the various groups. The first ones in the course should be very specific in the instruction of how to complete the job but after a boy has completed a job or two, he should be compelled to help work out the sequence himself.

Simple working drawings of all projects also should be provided with the instruction sheets. As the work progresses, the drawings may become more and more complicated, but they should never be beyond the reading ability of the student. The more advanced instruction sheets may consist of a working drawing and a skeleton outline of the processes, compelling the student to fill in the detail. Of course, wherever an entirely new situation arises, the instruction sheet should be very specific. In this way the student will come to realize that he is not making a magazine basket or a footstool but instead he is making a cabinetmaker of himself. He also should be made to realize that the project he is making is only secondary, while his training to meet future emergencies should come first. Of course, it is very desirable to have the student prepare his own working drawings, but that is only possible where the student has had a previous course in mechanical drawing. Where this is not the case, the most that the teacher of woodwork can hope to accomplish is to teach the student to read those drawings already prepared and to glean from them all the information that is given in the drawing.

Occasionally there will appear in the various groups of boys, some boys who have enough creative ability, to design their own projects. These should be encouraged to make their own designs, but it is expecting too much to think that every boy can be his own designer.

Demonstrations of the various processes involved in the course should be given as a part of the class-

work. Safety should be the watchword of the teacher at all times, and safety instruction should be a part of the classwork as well as an integral part of the individual instruction given the boy. One good aid in this respect is to have a list of safety rules for each machine posted on or near the machine in such a way that the boy is constantly reminded of the fact that he must be cautious when working around machinery.

Related Machine-Shop Subjects

George C. Donson

Supervisor Industrial Arts, Washington High School, Washington, Pennsylvania

The method of assigning related work as explained by the author is applicable in any kind of school shop.

RELATED work in the machine shop should not be merely busy work for the mentally incapable, but it should be a means of creating interest and should give the individual an opportunity to develop creative ability.

During the past year, the plan described herewith, for teaching related work in the machine shop, was worked out.

Early in the term each pupil is given a topic upon which he is to collect as much material as possible. No restriction is made as to the length of the essay, although the student is told that his essay should represent a good piece of work.

A place is set aside in the shop for a reading table upon which are placed such reference material as the *American Machinist Handbook, Machinery*, catalogs from manufacturers, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION and *Industrial Education* magazines, and a Pittsburgh directory. If the student does not find what he wants, he is permitted to use school stationery to write to any firm he chooses for information. The student also is permitted to clip illustrations from magazines, newspapers, and catalogs, for use in his essay. Each student also chooses the kind of title-page which is to go with his essay.

The following are some of the subjects chosen for these research essays which were written last term: The Engine Lathe, The Steam Engine, The Electric Motor, The Twist Drill, The Development of the File, Cutting Tools for the Lathe, Machine Tools for the Machine Shop, Shop Kinks, Gears, Chucks, Leather Belting, Tempering, Bolts, Milling Cutters, Grinding, etc.

It is a big problem for a teacher to judge the relative merits of a number of good papers, and the pupils should be informed from the beginning that the papers will be judged by people outside the school. The papers produced during the last term were judged by the editor of our city newspaper, a superintendent of a machine shop, and a shop foreman. These judges were much interested in their work and requested that the essays be submitted with numbers instead of names. One can always find people in the industries who are very willing to act as judges, and their work does much to attract attention and to create interest in schoolwork.

After the essays have been judged, they should be placed on a table so that every pupil may see what his neighbor has done. The students may also be given a few minutes to discuss their papers before the work of the day is started.

The following is an outline of the paper on "Grinding Machines."

Chapter I

1. Introduction.
2. The Plain Grinding Machine.
3. The Internal Grinding Machine.
4. The Surface Grinding Machine.
5. The Universal Grinding Machine.
6. The Cutter and Tool Grinding Machine.
7. The Cylinder Grinding Machine.

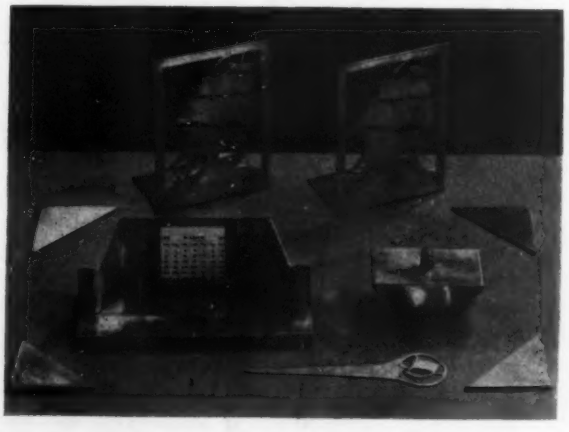
Chapter II

Grinding Wheels

8. Abrasives and Bonds.
9. Classification of Grinding Wheels.
10. Selection of Grinding Wheels.
11. Care of Grinding Wheels.

Chapter III

12. Factors in Successful Grinding.
13. Setting up the Work.
14. The Speed of the Wheel.
15. The Speed of the Work.
16. Cause of the Wheel Glazing.



Brass Desk Set Made in the General Metal Shop. Instructor, W. G. Phillips, Scranton, Pennsylvania

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. METZ, Editor

BENJAMIN FRANKLIN

Shop teachers will do well to dedicate at least a few minutes of some class period during the month of January to commemorate the anniversary of Benjamin Franklin's birth.

The printers point with just pride to this great man as their patron, and well they may, for a large portion of his lifetime was spent as an active member of their craft. So versatile was this man, however, that he may be looked upon as a model and example for men of all callings and in all walks of life. Especially is it fitting that he be looked upon as an exemplar for the students who are engaged in the study of industrial arts or of vocational education.

As one of the younger children in quite a large family, one may readily conclude that he was not pampered in his youth. His family was far from being rated as wealthy, hence his early education was quite meager. At the age of ten he entered his father's business, but the buying and selling of tallow and the making of soap did not interest him. His father therefore, with keen foresight, determined where he could better make use of the talents he had, and so this precocious youngster, who, in spite of his athletic inclinations was quite a voracious reader, was apprenticed to one of his brothers who conducted a printing establishment. Young Franklin in this manner not only learned a trade, but had more and more opportunity to indulge in reading. The two brothers, however, did not get along very well together, and so after working at the printer's trade in his brother's shop for some years, Benjamin left for Philadelphia. Here, because of his knowledge of printing, he had no trouble in finding work and later even went to London to learn more about the art. He spent about a year and a half abroad, after which he again returned to Philadelphia where he later bought the *Pennsylvania Gazette*. While his printshop and his writing took much of his time, nevertheless, he spent a great deal of thought and energy in taking care of his civic duties. Among the things which he accomplished, was the founding of the first American public library, he initiated a postal service, organized a fire company and a police system, served as clerk of the Pennsylvania Assembly, then as Postmaster of Philadelphia, later as Postmaster General of the Colonies. During the French and Indian War he guaranteed the transportation and supplies to Braddock's forces and personally carried much of the expense of this undertaking. Prior to the war of the Rebellion, he spent considerable time in England trying to avert the struggle between the Colonies and the mother country. He was one of the framers and signers of the Declaration of Independence. He also went to France to get financial and other help from that country for the colonists.

With all of these various activities clamoring for attention, he still found time to make scientific experiments. Among his inventions are the Franklin stove, the lightning rod, and various other ingenious scientific appliances. His famous kite experiment which he performed in order to prove that lightning was really an electrical discharge is, of course, well known. Less known probably are his experiments with which he proved that dark cloths absorbed more heat than those of a lighter hue.

At his death, which occurred on April 17, 1790, he was internationally known as a scientist, statesman, philosopher, inventor, writer, printer, diplomat, and a student. So high did he stand in the esteem of his countrymen that probably no one but Washington may be looked upon as his superior.

How well had Benjamin Franklin succeeded to build into his life all those attributes that a good industrial-arts teacher tries to instill into his students through the medium of the work which he gives in his courses. How splendidly had Benjamin Franklin achieved the love for work of a superior kind. How fertile was his brain in planning new devices for doing work well, or achieving success in a new way. How eagerly did he investigate new scientific discoveries, how diplomatically did he work with others to achieve the end which would be beneficial for all, and how much energy did he spend in working for the betterment of his fellows. Study Benjamin Franklin from any angle and he will be found worthy of the honor that was showered on him during his life and of the esteem which succeeding generations have bestowed upon him. It will be well for industrial-arts teachers in general if they add his biography to the books now on the reference shelves in the school shop.

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A CONSTITUTIONAL AMENDMENT

The American Vocational Association made quite a forward step in the seventh annual convention, when its House of Delegates approved the amendments to its constitution providing for representation of the Industrial-Arts group on the Executive Committee. This, of course, also included the election of a vice-president representing industrial-arts education.

Industrial-arts subjects have so much in common with the various phases of vocational education that the exponents of each of these two general fields ought, as a matter of course, work together. It is important that they should do so because they are really co-workers in the same field, and each can gain much from coöperating with the other.

The progress of the individual depends much upon how well he can coöperate with fellow workers and this holds true equally well of the progress of any group. The teachers of industrial arts and their fellow workers in the vocational field have demonstrated by their actions at Kansas City that they, too, want to coöperate to the fullest extent.

To anyone who has carefully watched the work of the Industrial-Arts group at the various A.V.A. conventions, it was apparent that this action of granting full representation was but to be expected. Year after year the industrial-arts sectional meetings were extremely interesting, and they were always well attended. The work of the special committees appointed in these sections was of an outstanding nature and the representatives who handled the affairs of the group were unquestionably of the highest type.

In spite of the fact that it was commonly expected that the American Vocational Association would amend its constitution as it did, nevertheless industrial-arts teachers in general were very happy over the outcome. They are now nationally represented. This in itself ought to act as a stabilizing influence the country over, and industrial-arts work ought to show greater progress because of this.

The American Vocational Association, on the other hand, has also gained by its action. There are numerous industrial-arts organizations in the various states that have not affiliated with the American Vocational Association because they felt that their cause was not fully represented. These organizations will now come in making the A.V.A. a larger and better association than ever before. Vocational education and its brother, industrial arts, both belonging to the same family, can now work in harmony emphasizing the things they have in common rather than those in which they differ, and thus achieve greater successes, each in their individual field.

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COMMERCIAL EXHIBITS AT CONVENTIONS

It is quite common for educational organizations to invite the commercial and industrial firms with which schools do business, to exhibit at the educational conventions held from year to year. These exhibits possess the advantage of bringing the manufacturer or seller directly in contact with the buyer or user of a given product. The teacher, supervisor, or educational administrator who may be located in some part of this country in which new equipment comes to his knowledge only through the printed word or through illustrations, when he visits the commercial exhibits at a convention, is in a position to study at first hand what these new inventions or improvements are able to offer him. In the same way, he may critically inspect new books, illustrative materials, charts, and teaching devices that are exhibited.

While the exhibit offers these advantages to those who are engaged in the school field, naturally, they also offer advantages to the manufacturer and seller of school equipment, books, and supplies, and the commercial exhibitor is quite cognizant of the fact that at such an exhibit he is able to come in personal contact with the users of his material and that it is to his advantage to be able to clearly explain and demonstrate the advantages of the wares which he is displaying. It must not be forgotten, however, that those firms which take advantage of such an exhibit pay quite heavily for the privilege. First of all, there is the exhibit space which must be paid for. Then there is the packing, transporting, and preparing the display. Then, because these firms feel that the school field requires a high grade of salesmanship, the men in charge of these exhibits are usually of the better-salaried type. This means additional expense. After the convention is over, there are the same items of again packing and transporting the material that has been on exhibit. Since all of this costs money, the exhibitor, being a business man, expects some kind of return.

Exhibits, if they are to be worth anything, must be properly housed and easily accessible. The time must also be given for making visits to the exhibit if either the commercial interests or the school field is to profit by the exhibit. If the exhibit is placed in a dimly lighted or unsuitable location, the visitor will not be attracted and the value derived from the exhibit is proportionately reduced. Placing the exhibit into one building and then having all of the meetings scheduled in buildings located elsewhere also is detrimental alike to the exhibits and to the conventions.

Every earnest schoolman who attends a convention goes there with a very definite objectives. He wants to learn everything that he can from both general and sectional meetings, but he also wants to get all he can from a study of the new equipment, materials, and books that will be on display. If the exhibit and the meetings are held close together, he can spend at least part of his time at the meetings and at the exhibit booths. If, on the contrary, the commercial exhibits are housed at a distance from where the meetings are held, the visitor must come to a decision whether he wants to miss one or the other. No matter how he decides the question, he suffers a distinct loss.

School conventions no doubt are expensive affairs. The income from selling exhibit space to commercial exhibitors is badly needed to cover some of the expenses incurred to make the convention a success. The manufacturer, school-equipment and supply dealer, textbook publisher, etc., are quite willing to help the schoolmen to make conventions a success. But business must also see to it that there is a commensurate income for the money which it expends. This should, therefore, be kept in mind by those who have anything to do with the arrangement and managing of conventions.

As already said, exhibits are useless unless they can be conveniently visited without undue loss of time. A convention headquarters in which the exhibits are housed, but at which the convention visitors are present only during the short periods of time between meetings held elsewhere, defeats the purpose of those who conduct the convention. Under such conditions either the convention program or the exhibitor's time and money is sacrificed because the arrangements have not been properly made.

Related Informational Material

H. John Paustian

Instructor Manual Arts,
Lincoln School, Madison, Wisconsin

Related informational material, to be worth while, must be effective.

IT seems that as long as we continue to have industrial-arts courses, just that long will we be able to classify shop teachers on the basis of the method which they use in presenting their shopwork.

There are teachers, for instance, whose boys come into the shop day in and day out, week after week, month after month, and do nothing but shopwork. These teachers give their students no related material; nothing in the way of demonstrations; no idea where all the lumber used in the shop was grown, what its characteristics are, what it might best be used for, or how it might be treated to produce the best finish; and they forget that there are a host of other related facts which would motivate their courses, and make the study of their subject more interesting. These teachers give their pupils no assistance in handling their tools, and use textbooks only when their use provides a convenient design. In short, these teachers are merely attendants who unlock the doors of their classrooms at the proper time, take the roll, police the groups, and see that the door is again locked at the close of the hour.

In contrast to this there is the shop teacher who provides informational material literally by the carload, and dumps it over his students, expecting them to swallow, assimilate, and make it function in their lives.

It is obvious that with the first type of teacher described in the foregoing, the students are being starved intellectually. Much that would be of value to them in enriching the course is lacking. The sin is worse than one of omission, for it is possible by such methods to so distort the attitude of junior-high-school boys toward shopwork that they will seek other lines of endeavor in which they might have less aptitude.

The second example illustrates the other extreme, and comes no nearer solving the problem of what use to make of related informational material, than the first. A shop teacher may make use of every device which his ingenuity can produce to make shopwork more interesting. Perhaps he provides related reading and actually has his boys reading it. He may use slides, films, pictures, models, exhibits, posters, charts, drawings, samples, pamphlets, booklets, lectures, demonstrations, discussions, tests, excursions — in fact any worth-while device which will further the aims of the course and interpret the objectives of the work, but unless all of this material is related and meets the requirements of evaluating criteria, it is of little value in the educational experience of the boy.

But what shall be this criteria? Industrial-arts work has not been standardized the country over. Where may the shop teacher get all this informational material? What shall be the basis of selection? How can it be organized into usable form? Obviously not all of it will fit into the needs of a particular situation. Doubtless these questions and many others have repeatedly arisen in the minds of conscientious teachers of shop subjects. Specific references to this problem in educational literature are scarce. Quite a number of writers make general statements to the effect that education must be broad even though specialized, and that one does not begin to do effective teaching unless he "takes account of the social, economic, industrial and educational conditions of the community."[1] Such statements appear frequently and may or may not be construed to refer to the particular problem herein stated. Judd says:[2] "When students have gained some knowledge of a subject through a few exercises, it is very important that they should be trained in generalizing this knowledge." It is easy for us to assume that here is our opportunity to use related material and train these students in generalizing their knowledge. Dooley, in a later chapter[3] says, "The method of teaching through real things, i.e., a real object, a model, or a photograph of the object is objective teaching." In the light of this definition, objective teaching is by no means limited to the field of industrial arts. In fact, one is sometimes led to think objective teaching is done everywhere but in the field of industrial arts.

That related informational material is valuable, no one doubts in the least, but just how valuable it is, is hard to determine. It is extremely difficult to measure through testing, and the evidence of its effectiveness is intangible. Vaughn and Mays in their excellent work[4] tell us that "Constructions and fundamental operations should be well illustrated. The method of a properly prepared text should be so presented as to encourage constructive and independent thinking, arouse curiosity, challenge investigation, and inspire sustained effort." Bobbitt[5] says "As a portion of the social training it is obvious that men should be brought to an understanding of the broadly, differentiated world of economic production and distribution. This understanding is to be developed mainly through reading, observation and discussion." Morrison says[6]

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[1]Dooley, *Principles and Methods of Industrial Education*, p. 63. Houghton Mifflin Co., Boston, Mass.

[2]Judd, *Psychology of High School Subjects*, p. 465. Ginn & Co., Boston, Mass.

[3]Dooley, *Principles and Methods of Industrial Education*, p. 337. Houghton Mifflin Co., Boston, Mass.

[4]Vaughn and Mays, *Content and Method of the Industrial Arts*, pp. 132–141. The Century Co., New York City, N. Y.

[5]Bobbitt, *How to Make a Curriculum*, pp. 199–208. Houghton Mifflin Co., Boston, Mass.

[6]Morrison, *The Practice of Teaching in the Secondary School*, pp. 401–415. The University of Chicago Press, Chicago, Ill.

briefly that the principle upon which units in practical arts may be set up is "a comprehensive and significant aspect of the environment."

The foregoing gives us a fair idea of the nature and the scope of the problem involved in the use of related informational material in shopwork. Doubtless teachers of other subjects are called upon to make use of teaching aids with which to supplement their text material, and related information is just as useful and as motivating in Latin as it might be in sheet metal. The problem may be said to be more acute with shop teachers, however, because of the comparative dearth of text material. Until quite recently, suitable texts were not available in any shop subject and a course of study was, and is even now, in many schools, a rarity. All this accounts, of course, for the fact that some teachers are still conducting nothing but manual-training shops. The significance of industrial arts has not yet dawned upon them.

In view of the evident lack of organized material, alert teachers formulated bodies of material which Friese has been pleased to call "Industrial Intelligence."[7] Friese lists five aims of nonmanipulative manual arts:[8]

1. To provide training in industrial arts and industrial-arts appreciation.
2. To provide a natural medium for guidance, vocational and educational.
3. To provide interesting technical information about the occupations represented in the school shop and others closely allied.
4. To provide studies in vocational economics closely related in everyday life.
5. To provide training in organized reasoning and problem solving.

No. 3 is especially applicable in our case; namely, "To provide interesting technical information about the occupations represented in the school shop and others closely allied." In commenting upon this, Mr. Friese says further: "The term 'Technical Information' then, limits the scope of the aim to those phases of industrial science which can be made of interest to junior-high-school boys, and which give a sort of bird's-eye view of the basic principles upon which industrial machines, products, and trade processes are built up." It would seem that this information would satisfy the natural craving of the boy to learn "why."

The selection of suitable informational material is the next major consideration. Peters sets up a criterion for curriculum building which he calls "Relative Utility."[9] He goes on to explain that mere utility may serve our purposes to an extent, but that even utility as a criterion may be misleading inasmuch that a teacher can build his own case in support of the things he has his boys do. But relative utility will imply that the material in question must be definitely related in purpose and content to the activity in which the boys are engaged, and which we will assume for the present, is purposeful.

In connection with his statement, Peters lists the following four tests of relative utility:

1. Frequency of recurrence.
2. Importance of relationships.
3. Many-sidedness.
4. Personal appeal.

Judging from these four tests, it would appear then that in the field of woodworking, for instance, the informational material to use, other things being equal, is that which (*a*) will be used most often in connection with the boy's own work, (*b*) serves important ends, (*c*) is useful in more ways than one, and (*d*) appeals to the boy more than any other particular piece of information. It is not enough then, to make an abstract assignment in the uses and characteristics of a dozen commercially important woods and forget about it. To have the assignment meet the tests of relative utility, it must of course meet the requirements enumerated above. After the teacher has made such a "foolproof" assignment, he may set about testing its validity. Perhaps the information will function in aiding the boy to intelligently select the right kind of wood for a bread board, rolling pin, or potato masher, since he may now be expected to know what requirements are to be met in these projects.

Douglass throws further light on the problem in a chapter entitled "Technique of Using Visual Aids."[10] He mentions five factors to be considered in determining what aids to use. They are as follows:

1. The degree to which the type of aid is adapted to the subject matter being taught.
2. The availability of the material.
3. The amount of time involved in the presentation of the material.
4. The importance and the need for visual presentation of the material being presented.
5. The relative effectiveness of the material.

Under the degree to which the type of aid is adapted to the subject matter being taught, we may assume that slides or films would not be necessary in presenting concrete work, for instance, or that lectures and excursions would be of little value in a course in home mechanics where the student is repairing a broken rocker. Obviously, this criterion should not be so difficult to apply to material being selected.

In considering the availability of the material, the instructor would necessarily be governed to some extent in the use of material by the amount which is at hand, or that he can easily secure. Many shop teachers have probably wished for a set of slides or a film with which to enrich the work in sheet metal, or machine shop, but such aids are not always available, in fact, in many cases, do not exist. It may be stated, however, that some type of visual aid can usually be obtained by the resourceful instructor.

The amount of time involved in the presentation of the material. Other things being equal, the amount of time involved should be governed by the needs of

[7]Friese, *Exploring the Manual Arts*, pp. 205–207. The Century Co., New York City, N. Y.

[8]*Ibid.*, pp. 41–42.

[9]Peters, *Foundations of Educational Sociology*, pp. 55–74. The Macmillan Co., New York City, N. Y.

[10]Douglass, *Modern Methods in High School Teaching*, pp. 205–240. Houghton Mifflin Co., Boston, Mass.

the class. A class in patternmaking which has acquired all the necessary skills, but has no idea of related material, and cannot associate patternmaking with other industries, is in need of related informational material. In such a case perhaps one half the time may well be spent in establishing industrial, social, and economic connections with patternmaking, provided, of course, the thing does not become distasteful to the students.

The importance and need for visual presentation of the material being presented. One may easily think of a number of tool operations where visual presentations are not necessary beyond that of using the tool itself. But in the field of aids, it is inconceivable that pictures or drawings are needed in teaching a boy to solder, or to repaint a section of screen wire. The inference at least, is that no great expense should be incurred in securing visual aids in a subject where their use is questionable.

The relative effectiveness of the material. This can be judged with difficulty and only by the trial and error method. The time to judge far-reaching effects of one's teaching is not in the present anyway, but in the future when the boys will have grown to manhood and will have had an opportunity to demonstrate how worth while a certain bit of teaching has been.

Extensive informational material related to every subject taught in your shops should be on file in the school library.[11] Experience has proved that librarians are happy to coöperate with shop teachers in compiling references, booklets, pamphlets and other teaching aids.[12] But the librarian needs the coöperation of the shop teacher in all this, for without it she has only a partial idea of what may be needed in a particular course. May it be suggested in this connection that when references are assigned in such related reading matter that the teacher prepare sheets containing pertinent questions to be answered out of the reading, that he give such a sheet to each boy, take the class to the school library, help the boys to find the references and supervise the reading. Such a procedure has been found to be much more productive of good results than merely announcing an assignment and as casually forgetting about it.

In the use of posters, it is to be hoped that no poster will ever be left on the bulletin board more than ten days at a time. If the poster seems to have educational value beyond this period, replace it with another, and later use it again. The effectiveness of many posters or series of posters has been materially reduced because the students have become as calloused to them as they have to the paint on the wall. A number of manufacturing firms print large-sized posters of recognized educational content. If a series is used, display each poster perhaps four or five days until the entire group has been shown. In this way such a series may be shown to advantage several times during the year.

Exhibits, likewise, are valuable, but as in the case of posters, they should be rotated rather frequently. The best way to display exhibits, of course, is to use glass display cases. These need not be elaborate. An old cupboard with glass panel doors has been found quite serviceable. Many worth-while exhibits may be loaned for a time, or can be purchased for small sums. Some concerns gladly distribute such material free.

A considerable variety of worth-while material can be shown with the aid of an opaque projector. Such machines, commercially made, are expensive, but a homemade job will answer the purpose. Drawings, pictures, charts and even objects can be projected upon the screen where the whole class may see them simultaneously.

The use of objective tests is to be encouraged, even though many argue that no one prepared test can fit all schools, because industrial-arts work varies so greatly from one locality to another. If this is true, such tests may be the means of bringing industrial-arts teaching more nearly up to a standard. Meanwhile, each teacher should become informed in the field of testing, and if it is necessary write his own tests.

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ADDENDA AND CORRECTIONS

Kindly make the following additions and changes in the article on "Illustrative Material for School Shops," by J. R. Phelps, page 341, December, 1932, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

Add "58. Republic Steel Corporation, Youngstown, Ohio," to the code on page 343.

Handbook for Drillers and *Ready Reference Chart*, page 343, should refer to code number (44 — F.) instead of (49 — F.).

Remove *Machine Cut Molding* (67 — F.), page 345. Supply is exhausted.

Drafting Room, Hershey Vocational School, Hershey, Pennsylvania

[11] Editorial, "What Has Your Library to Offer Your Students?" *Industrial Arts Magazine*, October, 1926. The Bruce Publishing Co., Milwaukee, Wis.

[12] Homer J. Smith, *Teaching Aids for the Asking*. University of Minnesota Press, Minneapolis, Minn.

High-School Aerodynamics

J. W. Giachino

Hamtramck High School,
Hamtramck, Michigan

The use of the air tunnel described herewith gives unusual interest to the study of aerodynamics.

AVIATION is gaining such headway today, that, without a doubt, it will equal and perhaps surpass other transportation industries in the not too distant future. Although the airplane is only slightly beyond the experimental stage, its developments have advanced far enough to assure it a permanent place. Air transportation, air-mail service, and passenger service have made such progress that their practical usefulness need no longer be questioned.

Each year governmental statistics show that there is an increasing number of people using the airplane as a means of transportation, and that a greater amount of freight and mail is being transported. This report should impress us with three facts: namely, that the modern airplane is comparatively safe, that its speed surpasses any other vehicle, and that the cost of air travel is rapidly reaching the level of other means of transportation.

If aviation is to become an important industry, the question arises, how far shall the schools go in preparing their students to meet this new field? Should the schools pave the way for the boys to understand, and possibly to enter the new industry? Most of the schools today are acquainting the pupils with the workings of the various existing industries. Therefore, why should they not begin considering the development of aëronautical studies. It must be realized, of course, that at present there are many difficulties to be confronted in organizing this new type of work. There are the problems of equipment, literature, and adequate space.

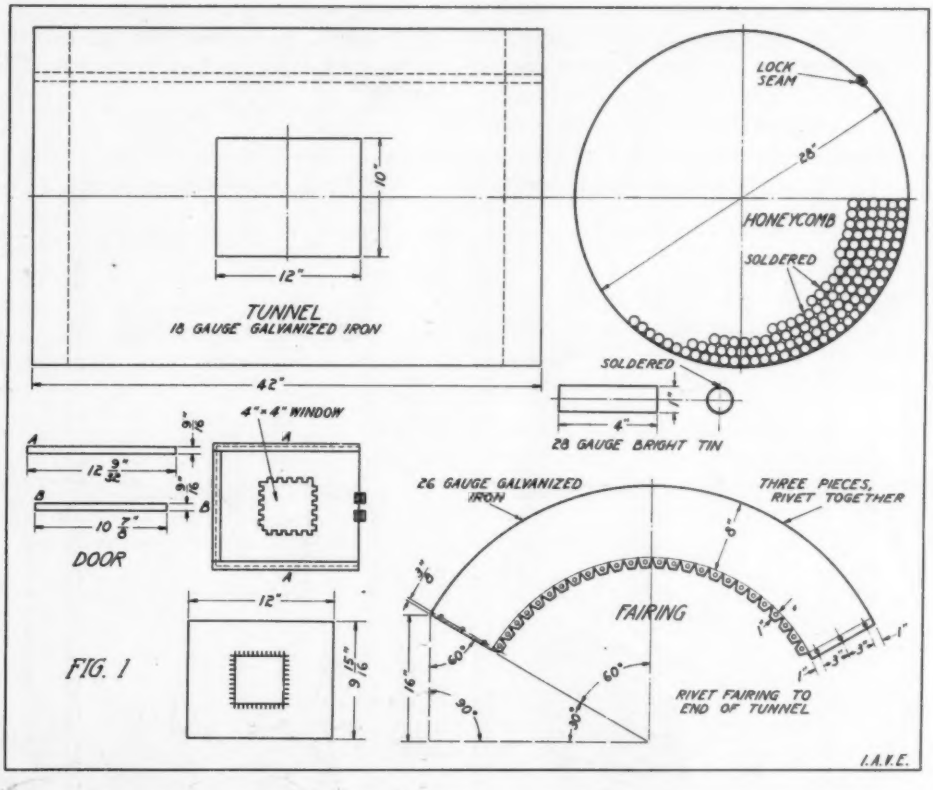
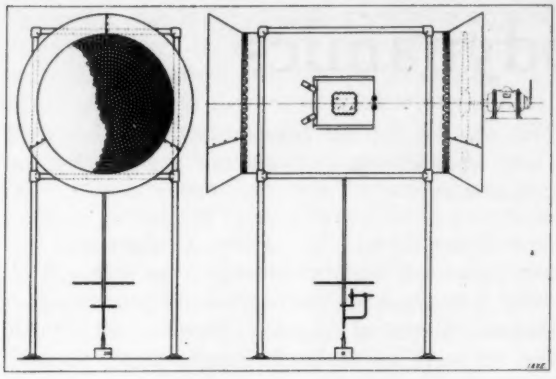


FIG. 1

The Hamtramck High School, in the past two years, has been working at the preparation of a course of study in aëronautics. Among other courses, a study of elementary aërodynamics is being conducted, in which the fundamental principles of flight are studied. To arrive at some realization of the various aërodynamical elements, the students have constructed a wind tunnel in which scale model airplanes may be tested. This tunnel may be built readily by any high-school class at a very small cost. Its operation will not only prove stimulating to the boys but also provide a most excellent shop project for them.



Tunnel Construction

The tunnel shown in Figure 1 is made of No. 18 gauge galvanized iron rolled into a cylinder. The two ends are fastened with a lock seam.

The fairing on both ends of the tunnel is made in three sections of No. 26 gauge galvanized iron. The pieces are riveted together and then riveted to the tunnel.

A section for a door is cut away in the center of the tunnel. Strips of thin metal are soldered to overlap the edges of the door, thereby insuring a better fit. To permit vision in the tunnel a section is cut out from the center of the door and then covered with a piece of celluloid or glass.

A honeycomb is built up in both ends of the tunnel for the purpose of straightening out the flow of air. The honeycomb consists of small tubes 1 in. in diameter and 3 in. in length. They are made of No. 22 gauge bright tin. In building up the honeycomb, the tubes are placed side by side and soldered together.

Frame

The tunnel is held rigidly in a frame constructed of ¾-in. galvanized pipes. The frame is bolted to a bench.

Balancing Mechanism

Turn hemisphere D out of a piece of solid brass. Drill a ⅜-in. hole through its center and solder it to the brass tube C, 3⅜ in. from one end. This tube is ⅜ in. outside diameter and 28½ in. long. Next, cut a piece of ¼-in. cold-rolled steel to a length of 38¾ in. File or grind one end of this rod to a sharp point and thread the opposite end. Insert this rod B through the brass rod C. The rods are held together by setscrew G.

Solder a piece of No. 18 gauge covered copper wire H to tube C, ½ in. above the half ball. This wire prevents the balance mechanism from revolving (see Figure 3).

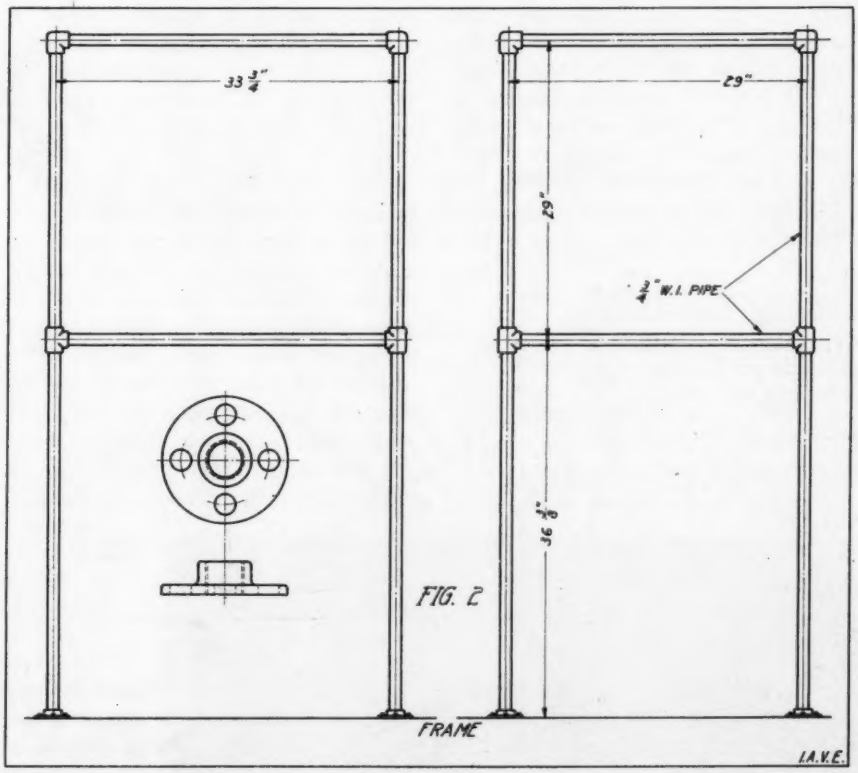


FIG. 2

A ½-in. hole is next drilled in the bottom of the tunnel. Over it is soldered a piece of copper or brass plate, ⅛ in. in thickness, which also has a ½-in. hole drilled through its center. Measure out 1 in. from this hole and cut a slot 2¾ in. in length and ⅛ in. in width, as shown in Figure 4.

To eliminate as much friction as possible, place a

small ball bearing in the hole (see Fig. 5).

Drop the rod through the hole letting the hemisphere rest on the bearing, and with wire H in slot I.

Next, solder two pieces of brass 7/32 by 12 in. at right angles to the vertical brass rod C, as shown in Figure 6. These are known as the lift and drag arms.

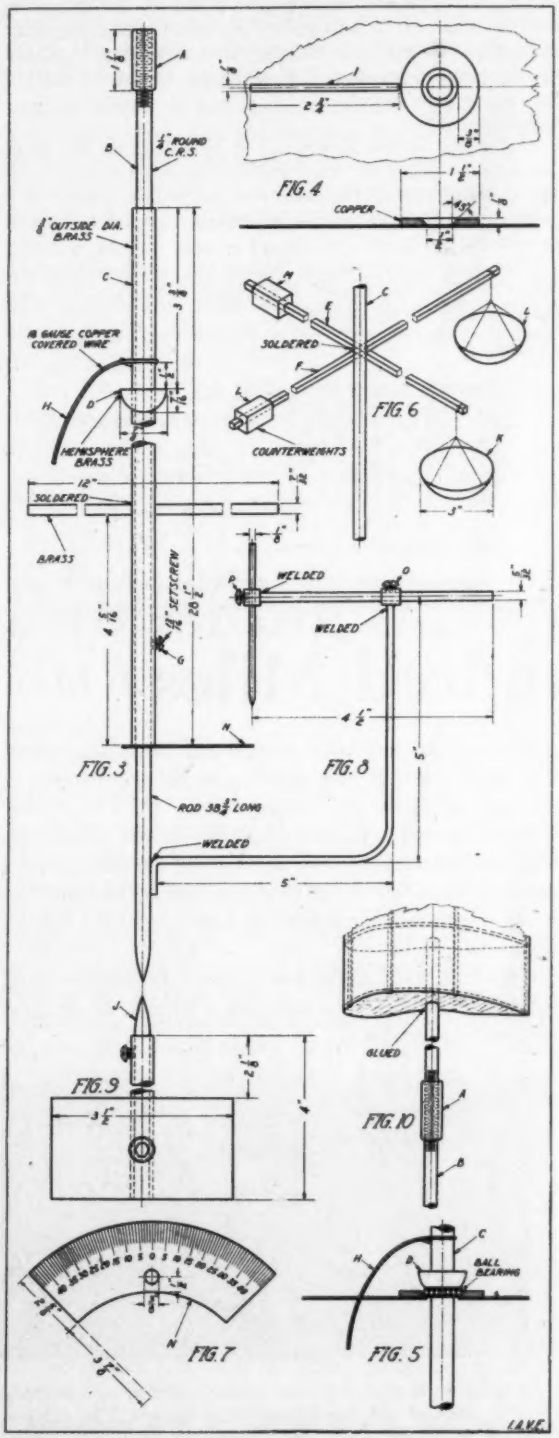
Then hammer out two weight pans of soft copper plate. Fasten them to the ends of the lift and drag arms K and L. On the opposite ends of these rods place the two metal pieces, F and M, which act as counterweights.

From a piece of copper plate cut out a protractor, laying out accurately the degrees as shown in Figure 7. Drill a 3/8-in. hole through the protractor and solder it to the rod C.

The pointer in Figure 8 is made of 1/4-in. cold-rolled steel. The pointer support is welded near the point of the vertical rod B. Setscrews at O and P permit adjustment of the pointer when the rod is set for various angles.

Directly beneath the vertical rod B, fasten the short pointed rod H. This rod is held in place by a brass tube 3/8 in. in diameter (see Fig. 9).

The airfoil or section to be tested is fastened to a short rod 1/4 in. in diameter, one end of which is threaded. The threaded end is screwed into a nipple A which is secured to the vertical rod B inside the tunnel (see Fig. 10).

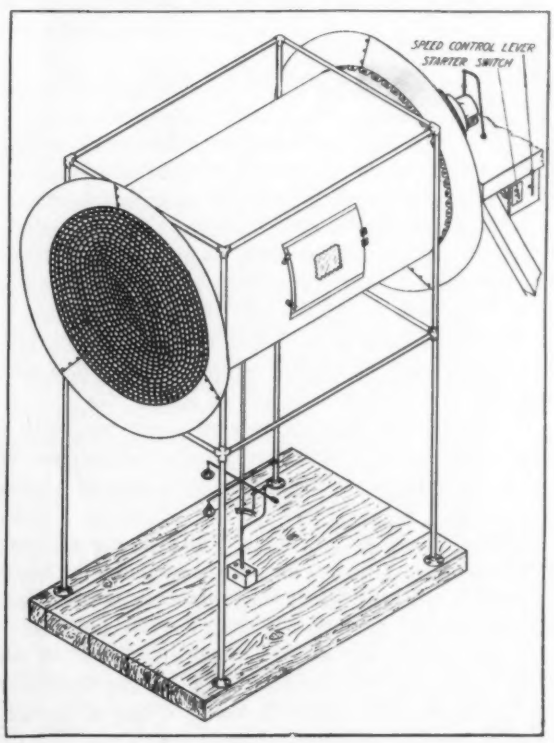


Propeller

The propeller may be made of gumwood, birch, or maple. It should be carved from a block 1½ by 3¼ by 28 in. The propeller is constructed so that it will suck the air through the tunnel. Extreme care must be taken in balancing the propeller, otherwise there will be considerable vibration.

Motor

A ½- or 1-h.p., variable-speed motor should be used for the tunnel. For most of the experiments the speed of this motor is sufficient, and so the propeller may be mounted directly on the motor shaft. In some instances a greater speed may be desirable. Mounting a large pul-



ley on the motor shaft and a smaller pulley on another shaft to which the propeller is fastened will increase the revolutions of the propeller. The ratio of the size of the pulleys may be 2 to 1 or 3 to 1. Using two sets of pulleys and two belts will eliminate a great deal of belt slippage.

The following are two of a number of experiments which may be carried out in the tunnel. Although the data obtained from these tests may not be one hundred per cent accurate, nevertheless the students will get a good insight into the work that is involved in the designing of an airplane. Moreover, these tests will permit the boys to get a much better understanding of the aërodynamic principles.

Experiment No. 1

The object of this experiment is to make a comparison of the lift and drag ratio of several airfoil sections.

Construct two or three airfoils of various shapes. These sections may be made of balsa wood, or any other soft material. Cover them with tissue paper.

Insert the small rod through a number of ribs near the front spar of the airfoil as shown in Figure 10. It should be securely fastened with glue.

Angles of Attack	Airfoil No. 1		Airfoil No. 2		Airfoil No. 3	
	Lift	Drag	Lift	Drag	Lift	Drag

Fig. 11. Chart for tabulating the findings

Mount the airfoil in the tunnel by screwing the rod into the nipple A on the end of the balance mechanism. Turn the rod B so that the pointer will rest on zero degrees. The leading edge of the airfoil must be directly in line with the zero reading of the protractor. Adjust the lower rod J so that it will just miss the vertical rod B. Move the counterweights to bring the pointed rod B directly above the lower rod.

Now set the airfoil at an angle of two degrees. Turn the motor on at one of the speeds. The wind will move the vertical rod. Add small proportionate weights in the lift and drag pans until the pointer is back in neutral position. Count the weights and tabulate the results in the chart shown in Figure 11. Carry out the test for angles of 4, 6, 8, 10, 12, 14, 16, 18, and 20 degrees for each airfoil.

Experiment No. 2

The object of this experiment is to determine the effect aspect ratio makes on these airfoils. Construct airfoils similar in design and of the same area but with a greater or a shorter span. Run these airfoils through a similar test, as in experiment No. 1.

Other experiments such as finding the center of pressure, resistance of various shapes of fuselages, lateral stability, and many others may be worked out.

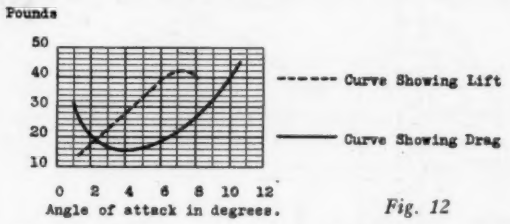


Fig. 12

The results may now be plotted as shown in Figure 12. Plot the angles of attack against the lift and drag in pounds.

The First Five Hundred Miles

Rex Aton

Instructor of Woodwork, Oak Park High School, Oak Park, Illinois

A new car is carefully driven the first 500 miles. The new student too, needs careful treatment.

This boy comes to you guaranteed to give you the best service and satisfaction if handled carefully and intelligently. Remember he is new and must be driven thoughtfully while being adjusted to the new road.

Supply him regularly with a high-grade fuel of knowledge necessary for smooth and efficient operation. Overloading and careless driving may cause a breakdown. If this should occur, do not relegate him to the junk pile, but consult competent repairmen who will help you place him in service again.

If knocks and squeaks develop along the road, a little oil of encouragement or a minor adjustment of working conditions may be necessary to restore smooth operation.

Keep him properly inflated with the confidence necessary to pass over the rough spots in the road, smoothly, as this will prohibit damage to the load. Remember underinflation is as bad as overinflation.

When working under an overload, occasionally allow time for cooling and self-adjustment of the automatic parts, for he will adjust himself to the reasonable working conditions for which he is built.

In the event a dullness appears in the finish, the original luster may often be restored by the use of a high-grade polish. Coarse, cheap polish, roughly applied, may cause scratches and blemishes that will remain always.

This boy is the finest product we can give you, and if handled intelligently will give a lifetime of faithful and willing service.

A workbench that has seen service for over a century. It is made of ash, hand-hewn from the log. The top is solid. Submitted by C. M. Gilmore, Hazard, Kentucky

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DETROIT MICH.

Girls' Home-Mechanics Club

I. M. Fenn

Industrial-Arts Instructor, Von Steuben Junior High School, Chicago, Illinois

Club work as a method of interesting girls in home-mechanics work.

GIRLS should be given a chance to gain experience in activities involving the care and upkeep of the home and appliances used in the home. For example, unless the girl who is helping her mother with the ironing has had such experiences, a fuse blown on account of short circuit in the attachment cord will cause loss of valuable time. The girl who has had home mechanics will know how to correct such trouble.

For this purpose a girl's home-mechanics club was started at the Von Steuben Junior High School. Its purpose was to give a knowledge of how to proceed rather than to transmit skill, and the club was successful from the very start. The demand for membership was so great that it had to be restricted to girls from the ninth grade only.

The following list shows the items that were included in the work presented to the club members: To prepare and use glue; to sharpen knives and scissors; to use a file; to remove old finish from furniture; to put new wire on screen frames; to cut and set glass; to use paint, lacquer and enamel, and clean brushes; to install electric bells; to refill and replace fuses; to read gas and electric meters; to replace fuller ball in faucet; to be able to solder; to use a hand drill; to use pliers and wire cutters; to fit and lay linoleum; to nail and draw nails; to use corner braces and mending plates in repairing furniture; to tighten loose joints on furniture; to adjust and repair a mortise lock; to fit keys to lock; to use a wrench; to use saw; to fasten with screws; to put knobs or pulls on doors; to reseat and repair upholstery; to attach casters and glides; to clean and refinish furniture and floors; to put up clothes line; to care for tools to prevent rust; to clean out traps in sink and floor drain; to wire a socket and plug; to repair and hang window shades; wrap and tie packages properly; and to repair appliance cords.

To make the work still more interesting, some art-metal work was introduced. This includes the making of desk sets and other articles out of copper and brass, and the making of jewelry.

Publishing a Departmental Paper

F. M. Keith

Senior High School,
Fort Smith, Arkansas

A successful method of advertising and popularizing industrial arts.

INDUSTRIAL-ARTS education merits the approval of any rational-minded person, yet the approval of the majority of academic instructors and pupils alike cannot be expected if they know little or nothing about the work except that it is done in "that department at the other end of the building." Nothing is gained either by telling them that their casual observance of industrial-arts work is unfair. It is assuredly not their fault that it is only a casual observance. If properly induced, they would gladly inspect this type of work more closely; and inspecting it more closely, they would learn its merits and recognize it for its true worth.

To illustrate how this inspection may be secured, it may be well to study how business goes about this very same thing. The school shop may be compared to the merchant's show windows. It is true, the merchant displays his best merchandise, but he does not stop with that. He knows that if he desires a large patronage, he cannot depend upon the few who see his display. He therefore makes use of advertisements in the newspaper. Through these he reaches the greatest part of the public.

The school shop striving for greater recognition in the other departments of the school, also may use a small departmental paper as a medium to show the kind of work which it produces. Such a paper, however, does more than serve as a mere advertising scheme for the industrial-arts department, for it at once tends to bring all of the pupils in the department more closely together. It also serves as a project both satisfactory to the instructor and interesting to the pupils in the printing classes. Finally, it serves the purpose of advertising the work of the department not only in school but in the community as well.

The first step, after the announcement was made, at the writer's school, that such a paper was to be published, each pupil was asked to submit a name for the new publication. Finally, out of a large number submitted, the name "Industrial Arts News" was chosen. Then a faculty supervisor was appointed, and class reporters were elected. Every industrial-arts pupil was asked to submit material, and with their enthusiastic assistance a neat-appearing 8 by 10½-in. eight-page publication made its appearance. This little paper has not only elicited favorable comment, but it has done a great deal to make known the industrial-arts department and to popularize the work taught by this department.

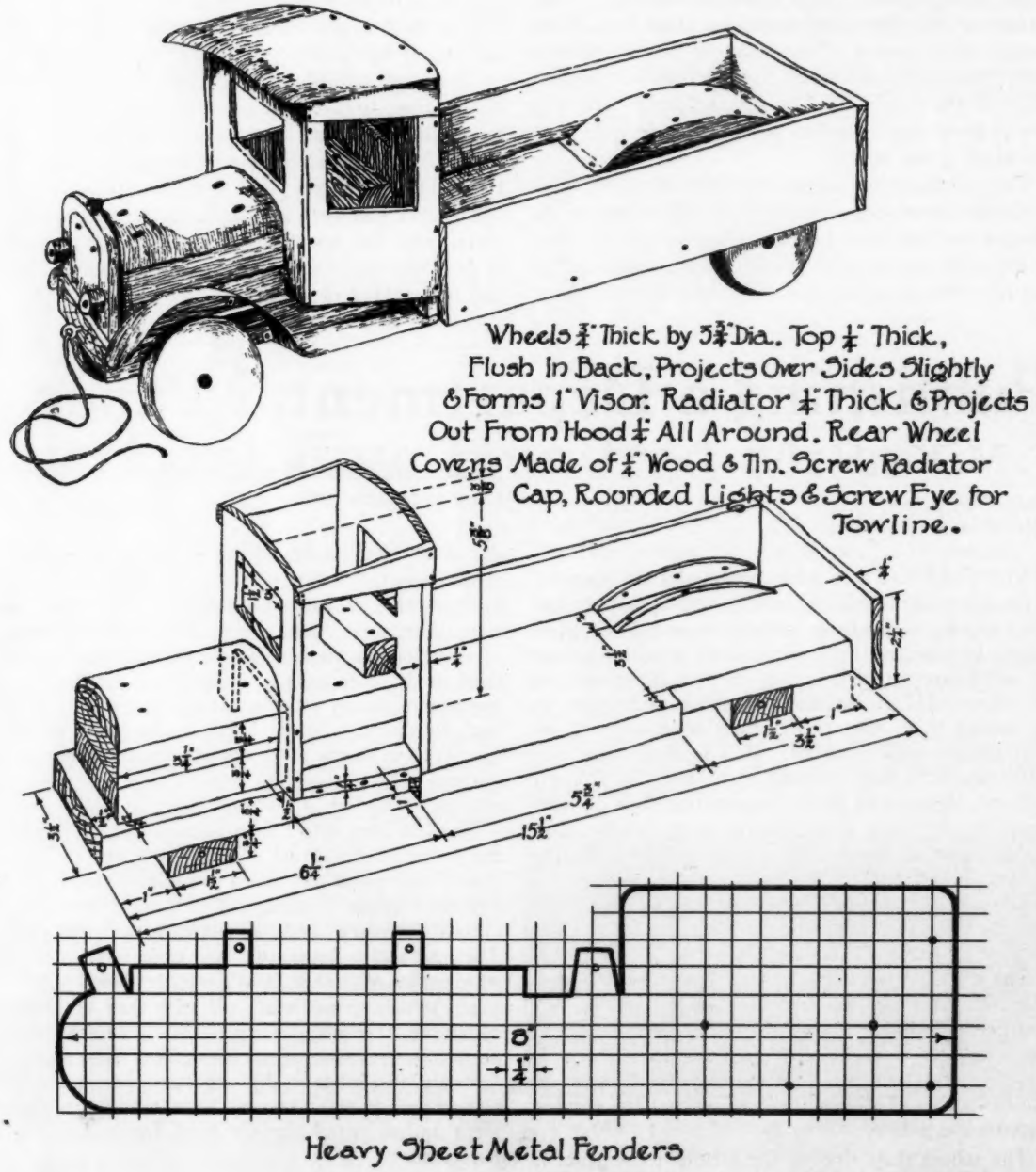
Problems and Projects

TOY TRUCK

Ken. F. Shepardson, La Crosse, Wisconsin

The toy truck provides a nice construction problem for elementary woodworkers and makes a very rugged toy which will stand the abuse of the most active child. Of the towed toys, the truck is perhaps the most popular with children.

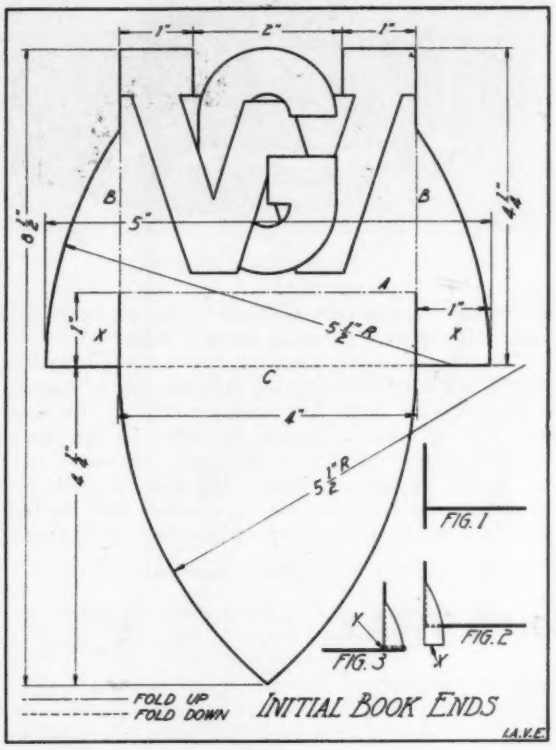
Starting with a single bottom board, spacers are made for the wheels. As each piece is cut to size, it is nailed into place to become a part of the whole. The plan of procedure, therefore, is not a separate construction of all parts before assembling, but a gradual building up of the parts. The pupil's interest is maintained from start to finish. He sees his problem growing and is motivated thereby.


Wheels ¾" Thick by 3¾" Dia. Top ¼" Thick, Flush In Back, Projects Over Sides Slightly & Forms 1" Visor. Radiator ¼" Thick. & Projects Out From Hood ¼" All Around. Rear Wheel Covers Made of ¼" Wood & Tin. Screw Radiator Cap, Rounded Lights & Screw Eye for Towline.
Heavy Sheet Metal Fenders

SHEET-METAL INITIAL BOOK ENDS

Allan V. Winegard, Glenside-Weldon Junior High School, Roslyn, Pennsylvania

The initial book ends shown herewith have become very popular in our sheet-metal shop. The initials chosen for the book ends may stand for the name of the school where they are made, or they may be the initials of the boy who makes them.



The book ends are an excellent elementary project and offer experience in cutting, folding, soldering, and the application of lacquer or enamel. The method of procedure is as follows:

1. Transfer the design to a sheet of IXXX tin.
2. Cut out the shape.
3. Fold square on line A as shown in Figure 1.
4. Fold square on lines BB (see Fig. 2).
5. Fold flaps XX under and solder them in place.
6. Fold on line C, as shown in Figure 3, and run a bit of solder along the inner edge, as shown at Y, Figure 3.
7. Apply two coats of lacquer.
8. Lay out the initials and fill them in with any desired color.

The GW (Glenside-Weldon) on the book ends shown herewith were finished in the school color.

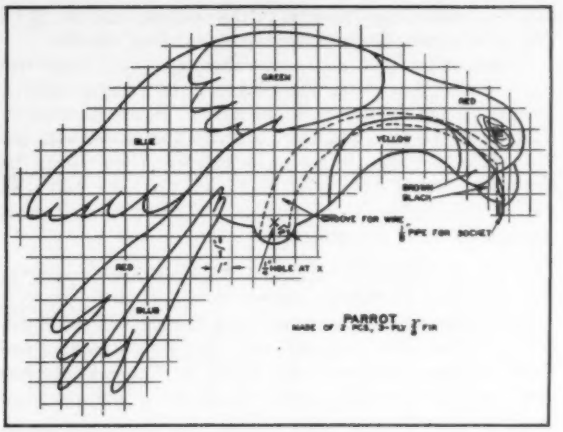
PARROT READING LAMP

D. M. Desiderio, McKees Rocks, Pennsylvania

The parrot reading lamp described herewith has been a popular project with my ninth-grade boys. It involves the designing and turning of the post, the transferring and cutting out of the design of the parrot, and the painting and wiring of the job.

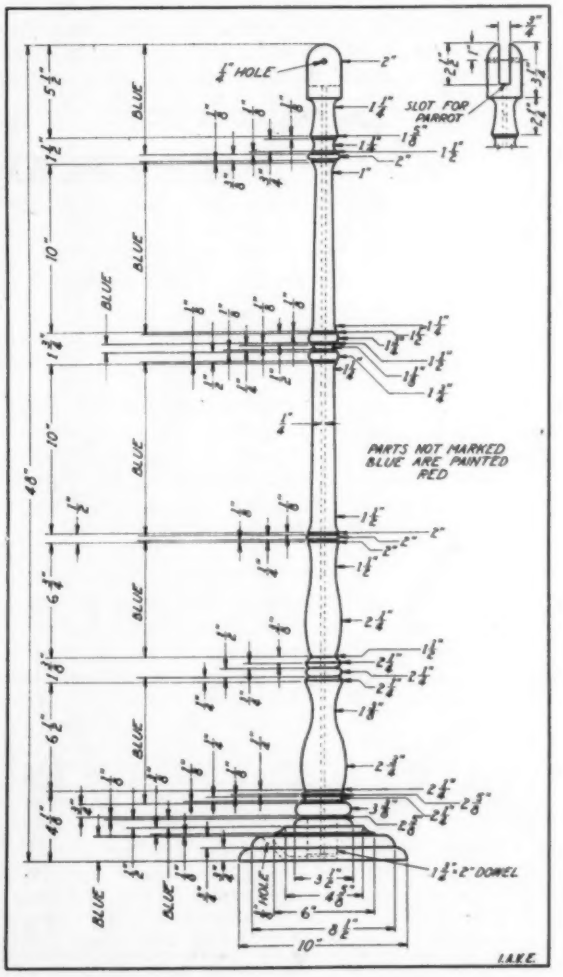
The parrot is made out of two pieces of 24 by 18, 3/8-in., 3-ply fir.

The groove for the wire is laid out and cut out of both pieces before they are glued together. Then the outline of the



parrot is drawn on the piece, and the whole is cut out on the band saw. A 1/4-in. hole is drilled at the point marked *x*, and the edges are smoothed up with a file or sandpaper.

The groove for the wire in the post is cut before the parts of the post are glued up. The ends are left solid so that the post may be better centered in the lathe. The dowel at the bottom of the post should fit snugly into the base. The base which is 2½ in. thick is glued up of several pieces to prevent warping. After the base is turned up, the hole for the wire is



The Standard for the Parrot Reading Lamp

drilled as shown. Slot the head of the post and drill the ¼-in. hole for the bolt. Then glue the post and base together.

Sandpaper the post and parrot thoroughly and apply two coats of thin flat white. Then lay out the various lines on the parrot and apply the colors shown in the illustration. Next finish the post and base. Then fit the parrot with the ⅛-in. pipe to which the socket is fastened. Then mount the parrot on a stand using a ¼ by 2¼-in. r.h. stove bolt with washer and thumb nut. A bulb and a shade is all that is required to finish the project.

A MULTIPLEX CAKE TRAY

Paul N. Wenger, Greenwich, Connecticut

This problem gives an opportunity for the advanced students in lathe work to make something very attractive and rather unusual. The cake tray, shown in Figure 1, contains more than 300 separate pieces. Poplar wood and gumwood were used in its construction.

Due to the fact that it takes considerable sawing, planing, and gluing, the material used should be rather soft. The combination of poplar wood and gumwood works out very well. It is essential to use wood that has been well seasoned, in order that the glue joints may remain closed.

If the material used is 1 in. thick, after gluing it may be cut into two parts, thus giving two ⅜-in. layers. This eliminates 50 per cent of the gluing efforts. The stock, about 12 in. long, should be cut into ⅜-in. strips (⅜ in. after planing both surfaces). The strips and layers may be greater or smaller than ⅜ in. if it is so desired. The strips are then alternated and glued together again. After gluing the strips, it should be cut and planed so that each layer will be ⅜ in. thick. The layers should then be placed and glued together

Fig. 1 The Multiplex Cake Tray

so that the strips in each alternating layer will be at right angles with the other layers, as shown in Figure 2.

After gluing the layers, the stock may be cut to a diameter of 11½ in., and fastened to the faceplate. As the diameter of the cake-tray handle does not exceed 2¼ in., the waste from each of the four corners will suffice for the handle. Glue these layers together for the handle and bore a ½-in. hole nearly through the layers. Also bore a ½-in. hole through the center part of the layers which form the tray. Insert glue and force a ½-in. dowel into the hole. This dowel

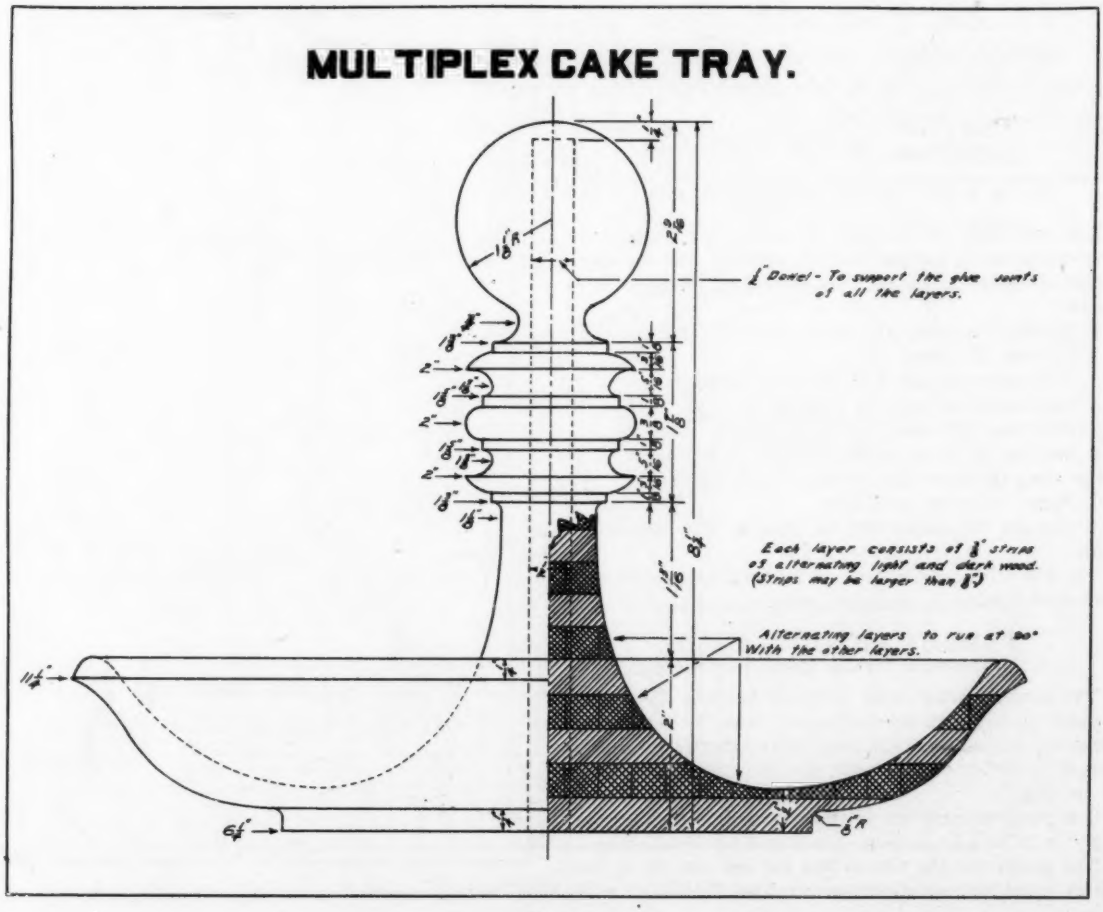

MULTIPLEX CAKE TRAY.
½" Dowel - To support the glue joints of all the layers.
Each layer consists of ⅜" strips of alternating light and dark wood. (Strips may be larger than ⅜")
Alternating layers to run at 90° With the other layers.

Fig. 2

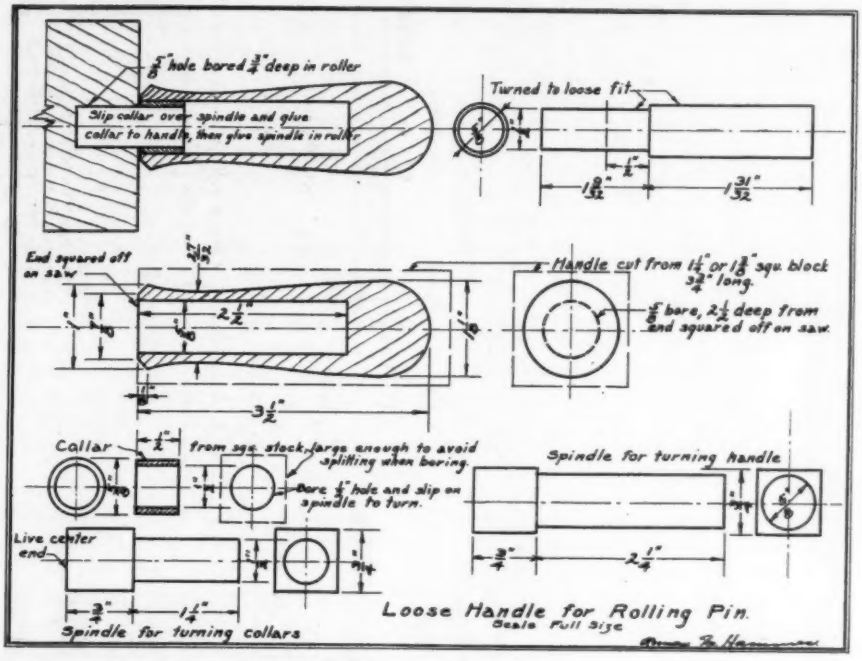
will support the various glue joints of all the layers. The dead center should be used to support the handle while turning the project to the given design. After the project has been turned and sanded, the dead center may be removed and the top of the handle shaped to a 1⅜-in. radius. The project should be given a good natural finish.

MINIATURE GOLF PUTTER

F. M. Walter, High School, Cortland, New York

Materials

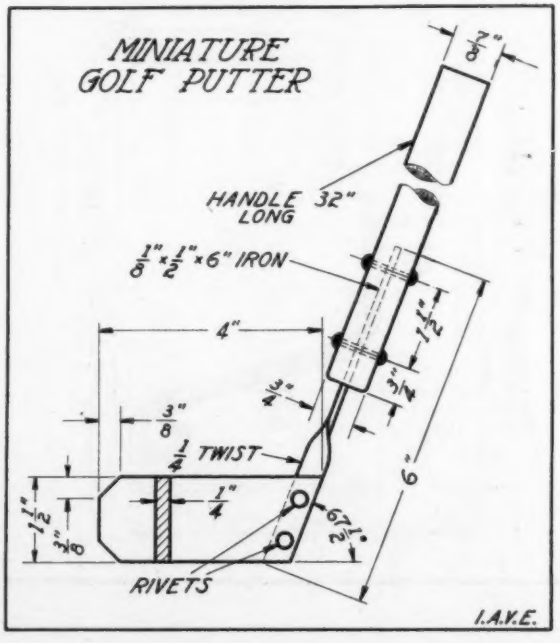
1 pc. iron, ¼ by 1½ by 4 in.
1 pc. strap iron, ⅛ by ½ by 5 in.
1 pc. wood, ⅞ by ⅞ by 32 in. (handle).


⅝" hole bored ¾" deep in roller
Slip collar over spindle and glue collar to handle, then glue spindle in roller
Turned to loose fit
End squared off on saw
Handle cut from 1¼" or 1⅜" squ. block 3¾" long.
⅝" bore, 2½ deep from end squared off on saw.
Collar
from sqe. stock large enough to avoid splitting when boring.
Bore ¼" hole and slip on spindle to turn.
Spindle for turning handle
Live center end
Spindle for turning collars
Loose Handle for Rolling Pin.
Scale Full Size

LOOSE ROLLING-PIN HANDLES

R. M. Hammes, Abraham Lincoln High School, Council Bluffs, Iowa

The illustration shown herewith describes how to make handles for rolling pins. In this day and age the rolling pin sees less use in the home, perhaps, than in bygone days. Nevertheless, the rolling pin is still used as a wood-turning project and this means of making loose handles will prove of interest and add something new to the old time-worn project.



Method

The iron head is cut out accurately with a hack saw and two holes ⅛-in. diam. are drilled for the shaft iron. The angle is to be 67½ deg. The strap iron, which is used for the shaft, is given a quarter twist for strength. The handle should be tapered slightly from ⅞-in. diam. to ¾-in. diam.

FIREPLACE SET

Gerald A. Boate, Seattle, Washington

The Andirons

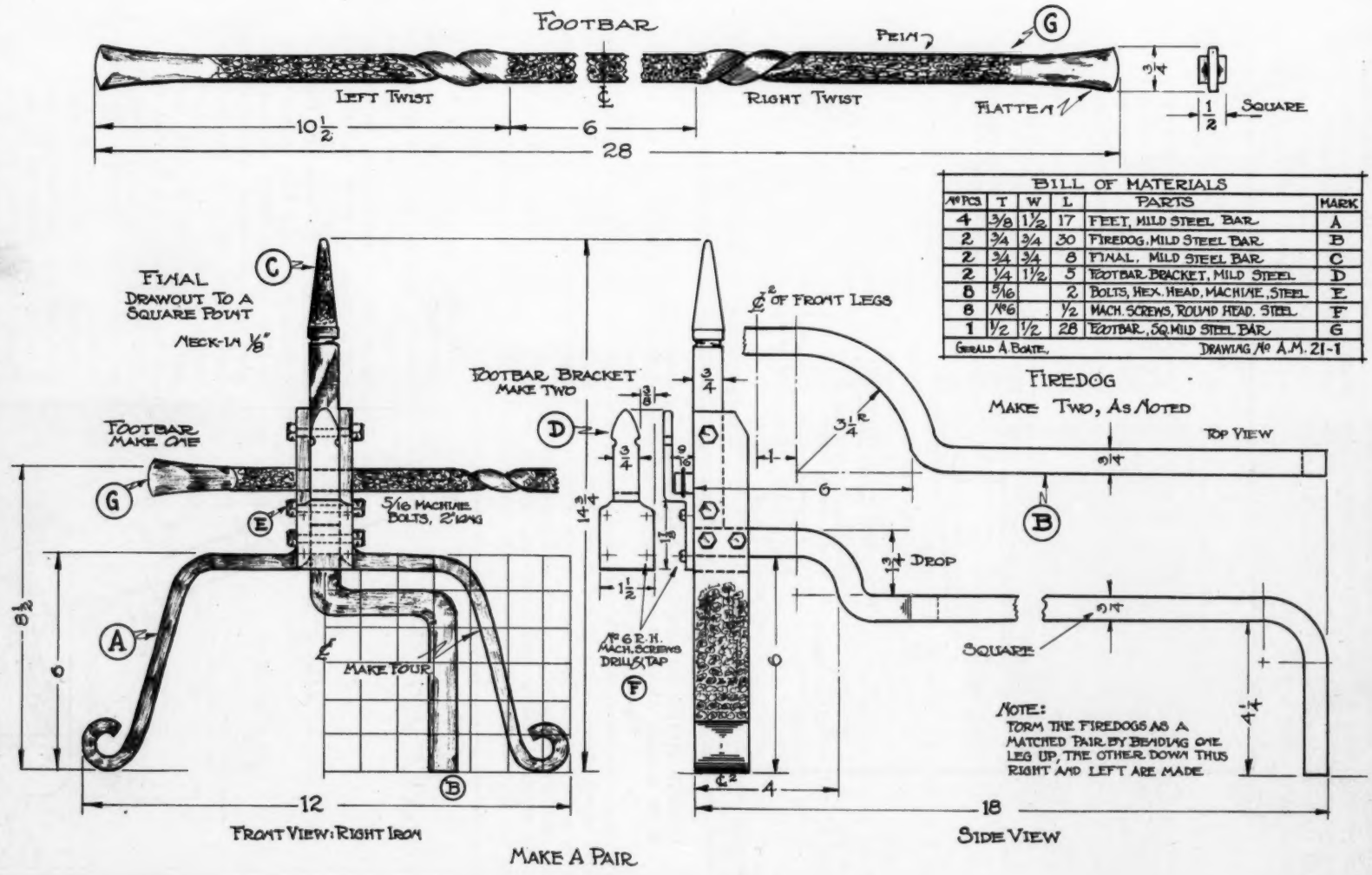
The pair of andirons illustrated herewith are built up of parts which are all hand forged. They are finished to harmonize with the other pieces of the set which have already appeared. If the parts are made in the order given in the bill of materials which appears on the drawing, those which must be similar may be matched as the work proceeds.

Forming the Parts

Feet — Part A. Cut four pieces of flat bar steel ⅜ by 1½ by 17 in. Heat and slightly splay one end of each piece, then grind or file the thinned end until all have the same form. Bend over the curl of the feet by beating the metal back while it is held on the anvil face. When the four feet are similarly curved, they should be quenched and the opposite end heated and forged to the shape shown in the illustration. Check bends and curves by stacking all of the feet edgewise and sighting. Any irregularities which appear should be corrected.

Firedogs — Part B. Cut two lengths of ¾-in. square bar stock, each 30 in. long. Heat and forge the curve shown at B in the side view, heating and forming the curves of the pair. Quench, reheat, and form the 1¾-in. drop. The back ends are forged so that one leg has a 4¼-in. upward bend, while the other bends downward. This makes the two opposite handed.

FIREPLACE SET: THE ANDIRONS



BILL OF MATERIALS

№ PCS	T	W	L	PARTS	MARK
4	⅜	1½	17	FEET, MILD STEEL BAR	A
2	¾	¾	30	FIREDOG, MILD STEEL BAR	B
2	¾	¾	8	FINAL, MILD STEEL BAR	C
2	¼	1½	5	FOOTBAR BRACKET, MILD STEEL	D
8	5/16		2	BOLTS, HEX. HEAD, MACHINE, STEEL	E
8	№6		½	MACH. SCREWS, ROUND HEAD, STEEL	F
1	½	½	28	FOOTBAR, SQ. MILD STEEL BAR	G

GERALD A. BOATE. DRAWING № A.M. 21-1

Finials — Part C. Two finials, ¾ by ¾ by 8 in., are needed. It simplifies the work if the two finials are forged as one piece, after which they may be cut in two with a hack saw. The finials are formed by drawing the ends out to long, square points. Neck them, to give a finished appearance.

Foot-Bar Brackets — Part D. The foot-bar brackets may also be formed and forged as a pair. The ¼ by 1½-in. bar may be reduced in width where necessary by sawing or using a hot or cold chisel. After forming, cut the two apart.

Foot Bar — Part G. The foot bar is made by heating and twisting a piece of ½-in. square steel, cut 28 in. long. The operations necessary have already been illustrated and described in the "Fireplace Poker" which appeared on page 27 of the January, 1931, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

Peening should be done on all parts, as shown, before they are assembled. Assembling consists of drilling 5/16-in. aligned holes in a pair of feet, a firedog, and a finial. The parts are bolted together with 5/16 by 2-in. hex.-head machine bolts and nuts. The foot-bar brackets are attached with No. 6, by ½-in. r.h. machine screws.

Finishing. All rust and scale should be removed with coarse emery cloth. A coat of flat black lacquer should then be applied. After the lacquer is dry, the peened surfaces are then rubbed with emery cloth until high lights appear.

A FOOD GRATER

Geo. E. Philipsen, High School, Rawlins, Wyoming

The household food grater is a very useful and inexpensive article, easily made by beginning home-mechanics classes.

Procedure. Secure a one-pound coffee can. The most desirable type is one whose lid has a slightly raised edge. Place the lid on the top of the can in an inverted position. Punch holes in the central portion of the lid with a hammer, using an 8d common nail as a punch. The lid is placed in an inverted position to facilitate the punching process as well as to produce a slight bulge in the lid, which allows easier access to the grating surface when in use. Replace the lid on the can in its original position and the grater is ready for use, the lower part of the can serving as a receptacle for the food. A can with a raised edge is desirable because this edge acts as a retainer for the food which does not pass through the grater.

A number of variations may be made by using punches of various sizes and shapes. To make the finished job more presentable the entire outside of the can and lid, with the exception of the grating surface, may be painted or enameled.

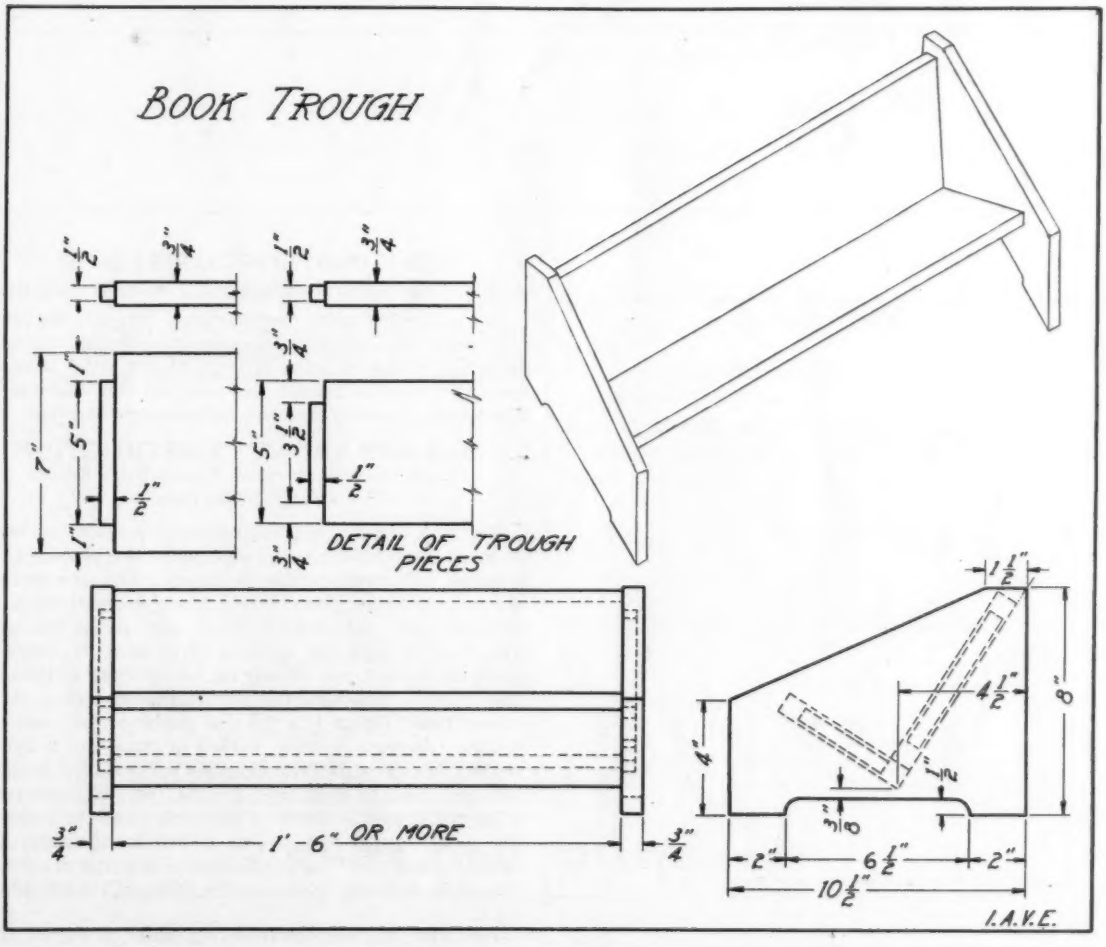
BOOK TROUGH

R. J. Watson, South Hills High School, Pittsburgh, Pennsylvania

Although not a new project the book trough, like books, appears now and then in a different form. The traditional book rack is hardly suitable for teacher's desks and library tables as it is too easily upset.

The book trough presents a neat appearance, is not easily upset, and offers an interesting shop problem in either advanced grade or elementary high-school shopwork.

The trough members can be jointed into the ends with mortise-and-tenon joints (concealed); or they may be glued,



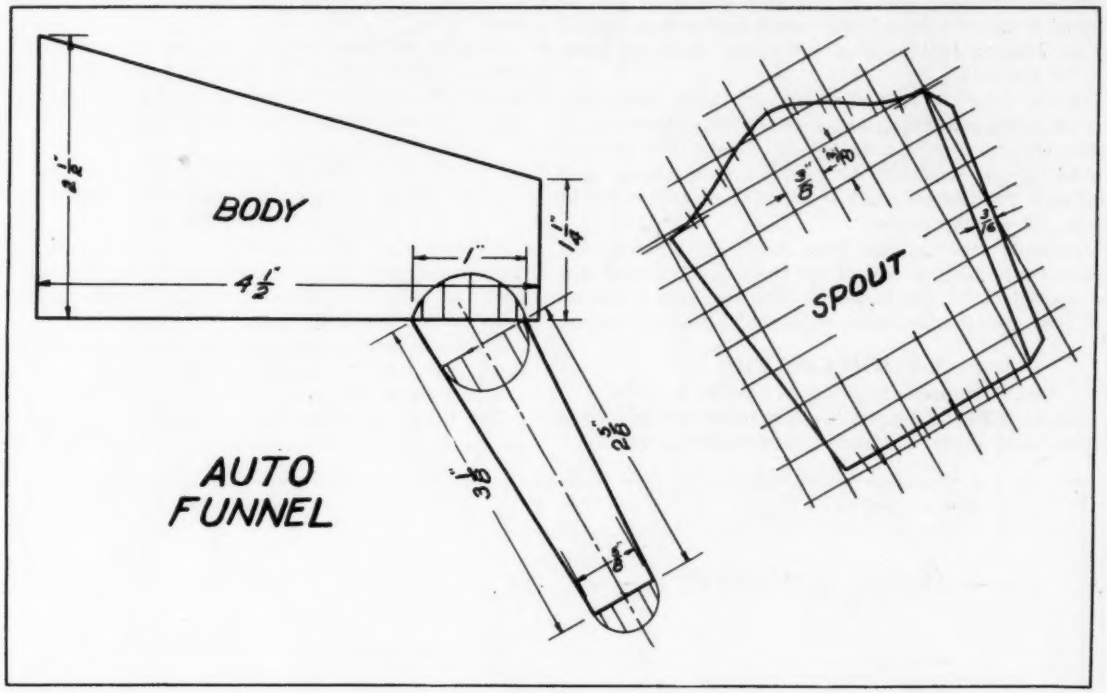
doweled, or screwed together. The length of this book trough can be varied to suit the particular needs of desk or library table.

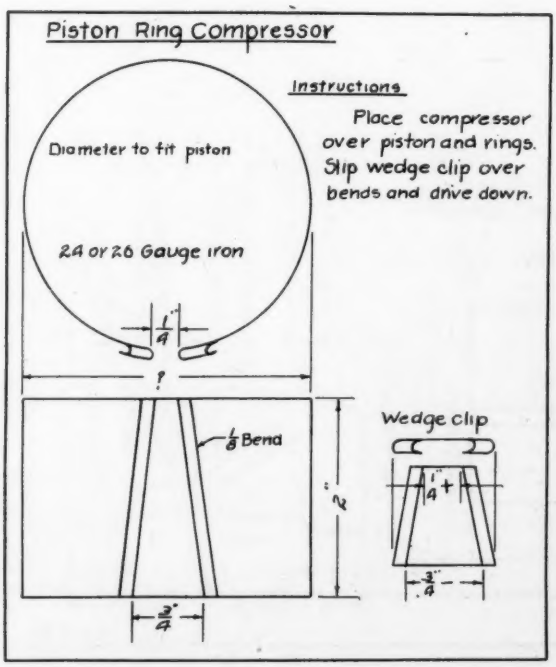
AUTO FUNNEL

Harry A. Lynch, Forest Park School, Fort Wayne, Indiana

The auto funnel shown herewith is very simple and even a seventh-grade boy can make one. The pattern for the spout may be developed by the boy or he can lay it out by plotting the shape of the development from the illustration shown herewith.

The body of the funnel may be made of a tin can which has been cut longitudinally as shown, and to which the ends have been soldered so as to be oiltight. The one end has been cut low so it will fit under the manifold when pouring oil. After the body has been made, cut a 1-in. hole with a hollow punch near the rim. This is for the spout. Then develop the spout as shown. After it is cut and formed, solder the seam and flange out the large end a little. Then push the small end of the spout through the 1-in. hole in the bottom of the body until it rests on the flange, after which solder it securely in place.





PISTON-RING COMPRESSOR

A. W. Dragoo, Illinois State Normal University, Normal, Illinois

The piston-ring compressor described herewith has proved quite convenient in replacing pistons especially those assembled from the bottom or crankshaft end of the block. It can be made in a very few minutes to fit any job that may come in. Scrap from the metal shop will furnish ample material.

DRAWER-FRONT CONSTRUCTION

R. M. Hammes, Abraham Lincoln High School, Council Bluffs, Iowa

The three forms of construction shown herewith are results of an effort at making school-shop jobs more pleasing in appearance and more flexible in design. With the veneered drawer-front construction, curved fronts, recessed types, and two-tone and vertical-grain effects are easily obtainable. The front is ordinarily made of birch with the veneer of panel stock which may or may not be cut down in thickness. The gluing is done with the use of ordinary clamps. In the curved front, Figure 1, a piece of poplar or bass was used because this stock is easily worked to shape and is light in weight. The waste piece cut from the curve is used in clamping the veneer to the curve. For the more intricate curves a felt pad is used between the waste piece and the veneering. The panel stock is planed down so that it will readily bend to the curve desired. The possibilities of this type of construction are limited only by the creative ability of the one employing it.

By cutting through the veneer, as shown in Figure 2, de-

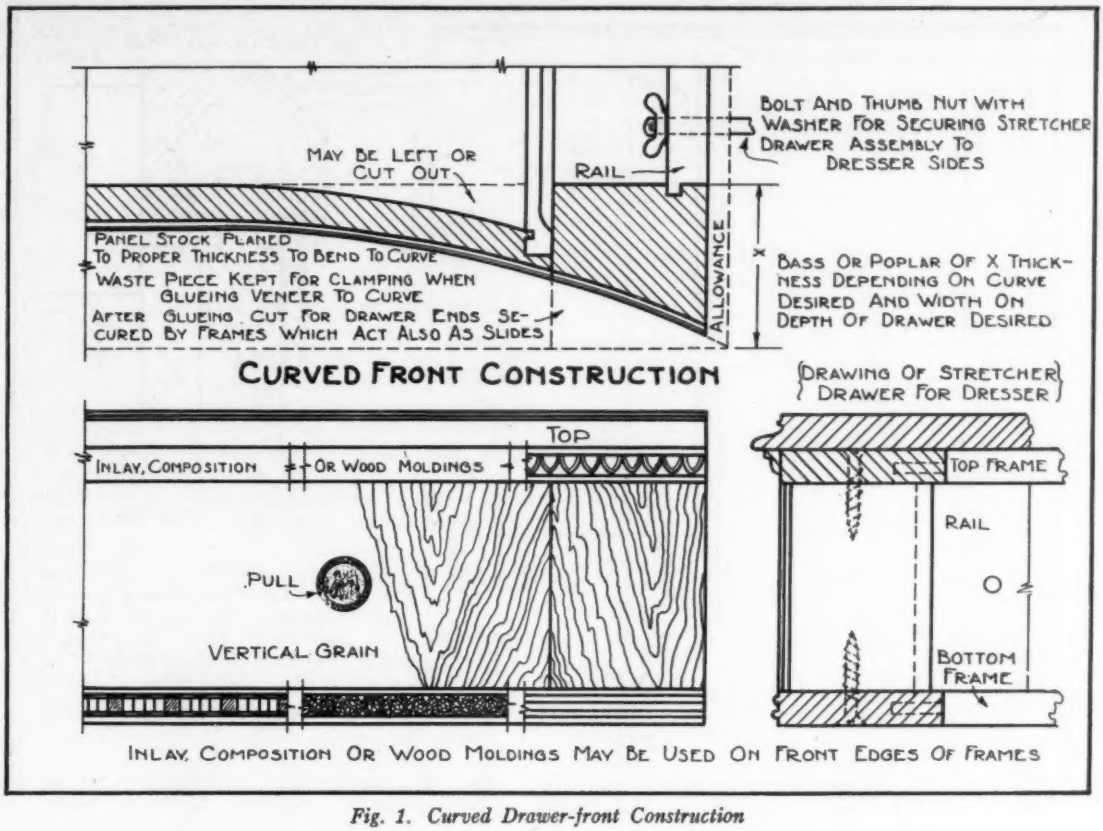

BOLT AND THUMB NUT WITH WASHER FOR SECURING STRETCHER
DRAWER ASSEMBLY TO DRESSER SIDES
MAY BE LEFT OR CUT OUT
RAIL
PANEL STOCK PLANED TO PROPER THICKNESS TO BEND TO CURVE
WASTE PIECE KEPT FOR CLAMPING WHEN GLUEING VENEER TO CURVE
AFTER GLUEING CUT FOR DRAWER ENDS SECURED BY FRAMES WHICH ACT ALSO AS SLIDES
ALLOWANCE
X
BASS OR POPLAR OF X THICKNESS DEPENDING ON CURVE DESIRED AND WIDTH ON DEPTH OF DRAWER DESIRED
CURVED FRONT CONSTRUCTION
DRAWING OF STRETCHER DRAWER FOR DRESSER
TOP
INLAY, COMPOSITION OR WOOD MOLDINGS
PULL
VERTICAL GRAIN
TOP FRAME
RAIL
BOTTOM FRAME
INLAY, COMPOSITION OR WOOD MOLDINGS MAY BE USED ON FRONT EDGES OF FRAMES

Fig. 1. Curved Drawer-front Construction

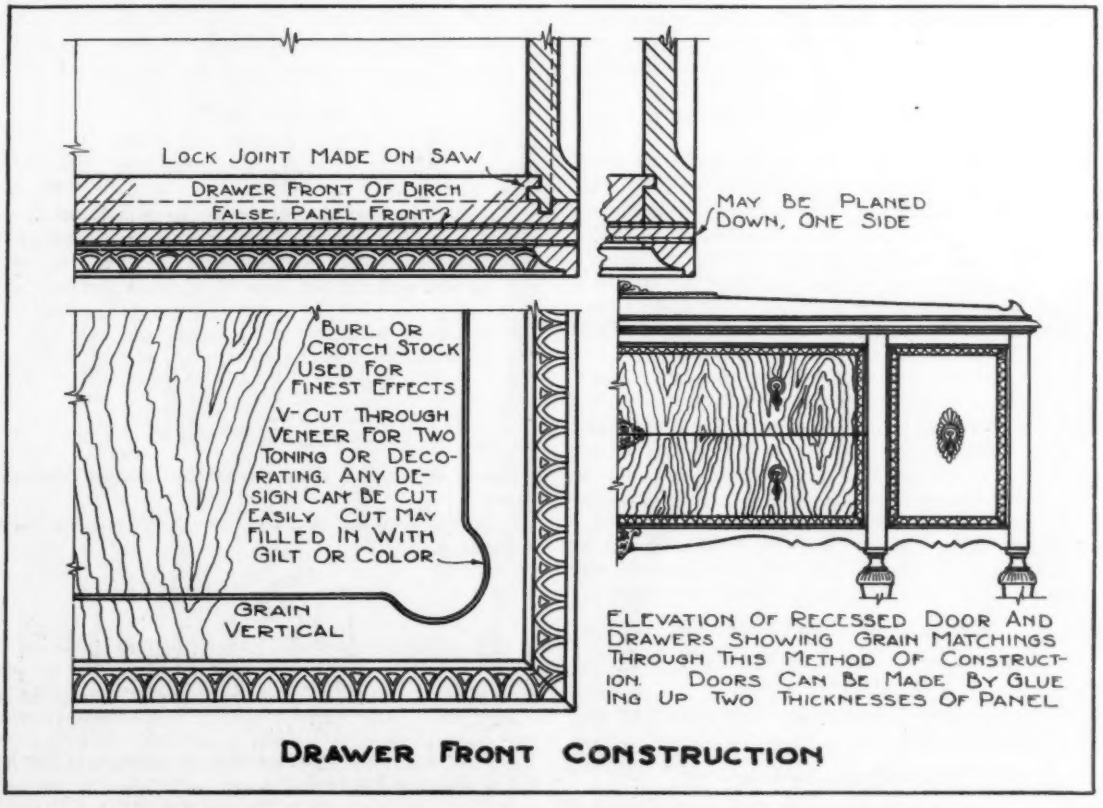

LOCK JOINT MADE ON SAW
DRAWER FRONT OF BIRCH
FALSE PANEL FRONT
MAY BE PLANED DOWN, ONE SIDE
BURL OR CROTCH STOCK USED FOR FINEST EFFECTS
V-CUT THROUGH VENEER FOR TWO TONING OR DECORATING. ANY DESIGN CAN BE CUT EASILY CUT MAY FILLED IN WITH GILT OR COLOR
GRAIN VERTICAL
ELEVATION OF RECESSED DOOR AND DRAWERS SHOWING GRAIN MATCHINGS THROUGH THIS METHOD OF CONSTRUCTION. DOORS CAN BE MADE BY GLUEING UP TWO THICKNESSES OF PANEL
DRAWER FRONT CONSTRUCTION

Fig. 2. Drawer-front Construction with Veneer — cut to produce various effects

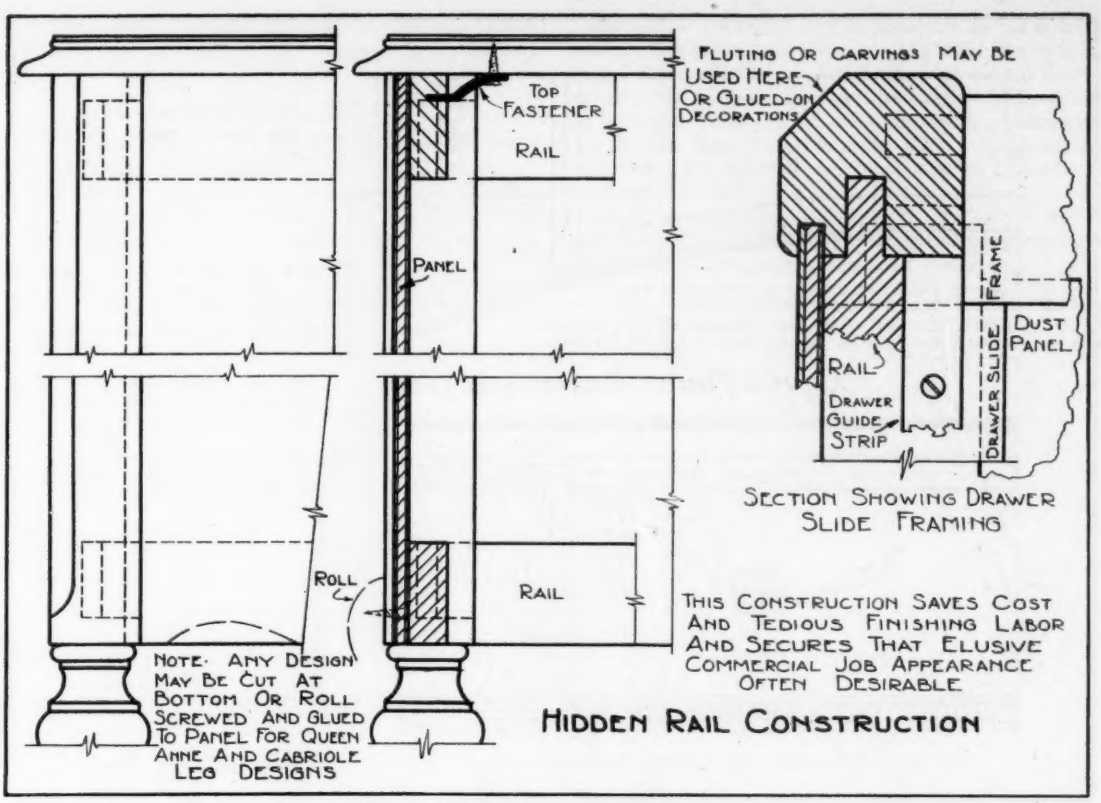

FLUTING OR CARVINGS MAY BE USED HERE OR GLUED-ON DECORATIONS
TOP FASTENER
RAIL
PANEL
FRAME
DUST PANEL
RAIL
DRAWER GUIDE STRIP
DRAWER SLIDE
SECTION SHOWING DRAWER SLIDE FRAMING
ROLL
RAIL
THIS CONSTRUCTION SAVES COST AND TEDIOUS FINISHING LABOR AND SECURES THAT ELUSIVE COMMERCIAL JOB APPEARANCE OFTEN DESIRABLE
NOTE· ANY DESIGN MAY BE CUT AT BOTTOM OR ROLL SCREWED AND GLUED TO PANEL FOR QUEEN ANNE AND CABRIOLE LEG DESIGNS
HIDDEN RAIL CONSTRUCTION

Fig. 3. Drawer-front with Hidden Rails

signs of various types may be produced, or the inside veneer peeled out and burl or crotch-grain veneer glued in to give most enhancing effects. Color or gilt also may be run along the groove cut into the veneer and then a two-tone finish may be used. Inlay cuts are easily made in veneered fronts, and sanding and rubbing down are easily done on this panel veneer stock.

The blind or hidden rail form of construction, shown in Figure 3, is used extensively in commercial work. The finished product has a more delicate appearance covering unsightly joints and doing away with shoulders of rails. This also simplifies the gluing of the assembly as the panel is slipped in after the gluing up has been done. All sanding is completed before the paneling is slipped in and rubbing down is more easily and better done because there are no rails to interfere. The result as a whole is very pleasing.

The new moldings now obtainable in the market are a happy addition. Formerly moldings for recessed drawers and beneath table tops and for coves had to be cut in the school shop. This limited them at once to straight molding designs. Now all the classical forms of furniture trim are available. For curves and ornaments the composition carvings are adaptable, as they become pliable by steaming and can be glued to bases of any shape. They are made of wood fiber and are very satisfactory. The little extra time spent on decorating the pieces made in the school shop is more than repaid.

TABLE-TOP FASTENINGS

P. S. Burns, James Madison Junior High School, Seattle, Washington

In all of the following illustrations the table tops are considered to be ⅞ in. thick.

Nail and Screw Fastenings

Figures 1, 2, and 3 show the table top fastened down with nails.

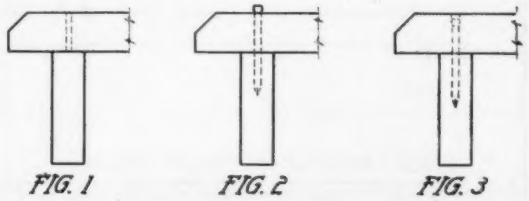


FIG. 1 *FIG. 2* *FIG. 3*

1. Drill ⅛-in. hole in table top as shown in Figure 1.
2. Hammer in a 6d finishing nail until it is about ⅛ in. above surface as shown in Figure 2.
3. Set nail with nail set about ⅛ in. below surface.

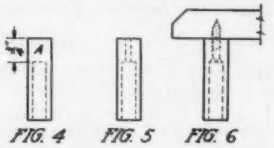


FIG. 4 *FIG. 5* *FIG. 6*

Figures 4, 5, and 6 show a table top fastened down with screws.

1. Bore a ½-in. hole part way through side rail A as shown in Figure 4.

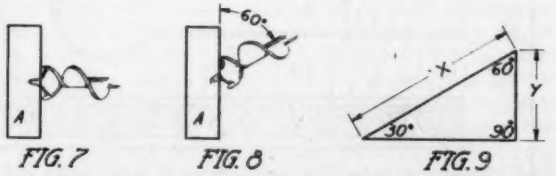


FIG. 7 *FIG. 8* *FIG. 9*

2. Bore a 3/16-in. hole through the balance of the side rail as shown in Figure 5.
3. Place the table top in position and fasten with a No. 10 by 1¼-in. f.h.b. screw as shown in Figure 6.

Figures 7, 8, 9, 10, 11, 12, and 13 show a table top fastened with screws in a different manner from the one described in the foregoing.

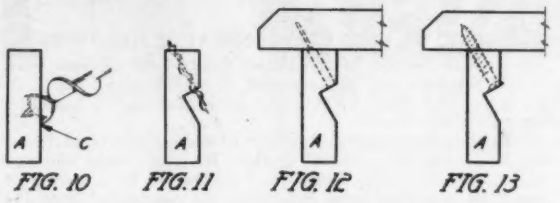


FIG. 10 FIG. 11 FIG. 12 FIG. 13

1. Start the point of a 7/16-in. or ½-in. auger bit in rail A about 1⅛ in. from top edge at right angles to the rail as shown in Figure 7. When the spur of the bit takes hold, slant it about 60 deg., as shown in Figure 8. (*Note:* Rail has been turned over so that its top is at the bottom to make the boring of the hole easier. A 30–60-deg. template may be made by making the right-angle triangle shown in Figure 9 with side X twice the length of side Y.

2. Continue to bore hole at the angle of 60 deg. until the lower part of the lift starts to cut as shown in Figure 10. Then remove bit.

3. Next drill a 3/16-in. hole through the side rail at 30 deg. to the side as shown in Figure 11.

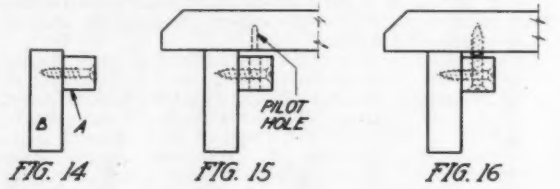


FIG. 14 FIG. 15 FIG. 16

4. Place the table top in position as shown in Figure 12 and drill 3/32-in. pilot hole for the screw. (This is not necessary for soft wood).

5. Figure 13 shows the table top in position, held securely with a No. 10 by 1½-in. f.h.b. screw.

Wood Fastenings

1. Fasten a ¾-in. square cleat A (see Fig. 14), through which ¼-in. countersunk holes have been drilled, with No. 9 by 1¼-in. f.h.b. screws, to the side rail B about ⅛ in. below the top edge.

2. Place top in position and bore a 1/16-in. pilot hole as shown in Figure 15. The pilot hole is not required if soft-wood tops are used.

3. Fasten table top with screws as shown in Figure 16.

Note: The screw holes in the cleats are larger than necessary in order to allow for expansion and contraction of wood.

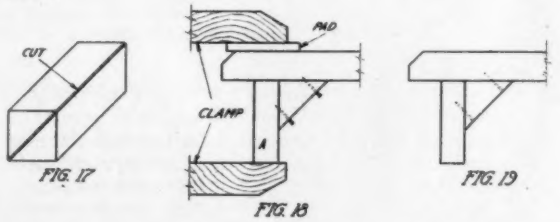


FIG. 17 FIG. 18 FIG. 19

Figures 17, 18, and 19 show how triangular cleats may be used for fastening table tops.

1. Cut diagonally a piece of 1½-in. stock 6 in. long, as shown in Figure 17.

2. Clamp the table top on the rail, as shown in Figure 18.

3. Turn table top over. Glue triangular pieces in place, using No. 14 brads ¾ in. long to hold cleat in place, as shown in Figure 19, while glue is drying.

Figures 20, 21, 22, and 23 show a method of fastening in which a wood button is used.

1. Cut a ⅜-in. slot ¼ in. deep in rail A, ½ in. from its top edge, as shown in Figure 20.

2. Make the button shown in Figure 21.

3. Place the table top in position and drill a 3/32-in. pilot hole for the screw if the top is of hard wood. This is shown in Figure 22.

4. Fasten down the top as shown in Figure 23 using a No. 10 by 1¼-in. f.h.b. screw.

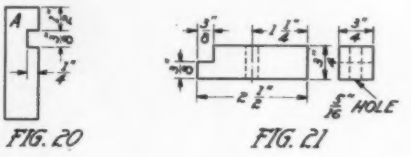


FIG. 20 FIG. 21

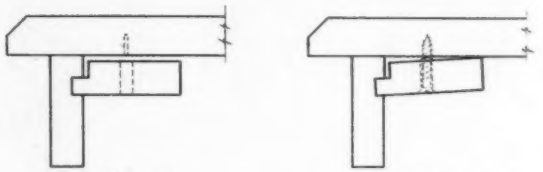


FIG. 22 FIG. 23

Metal Fasteners

Figures 24, 25, and 26 show a metal fastener which is similar to the wood-cleat method shown in Figures 14, 15, and 16.

1. Fasten the angle iron shown in Figure 24 to the side rail about ⅛ in. below its edge, as shown in Figure 25.

2. Fasten table top to side rail as shown in Figure 26.

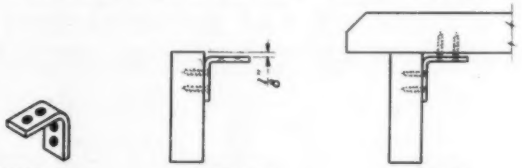


FIG. 24 FIG. 25 FIG. 26

Figures 27 and 28 show a metal fastener similar to the wood-button method shown in Figures 20, 21, 22, and 23.

1. Measure dimension X on the fastener to be used (see Fig. 27).

2. Cut slot into side rail as shown in Figure 28.

3. Fasten table top in place.

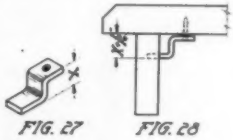


FIG. 27 FIG. 28

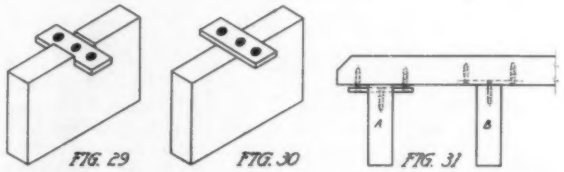


FIG. 29 FIG. 30 FIG. 31

1. As shown in Figures 29, 30, 31, a metal plate may be either countersunk in rail A and set about 1/16 in. below the edge (this allows the top to be drawn down tightly) or it may be fastened on top of the rail and countersunk into the table top.

2. Fasten the table top as shown at B or C (Fig. 31) depending upon the method of fastening the plate.

1. Figures 32, 33, 34, 35, 36, and 37 show another type of metal plate fastener which, as shown in Figure 32, may be countersunk into the rail so that it is ⅛ in. below the top edge of the rail, or it may be fastened on top of the rail and countersunk into the table top, as shown in Figure 33.

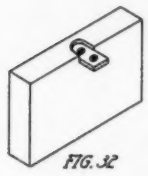


FIG. 32

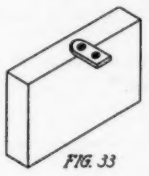


FIG. 33

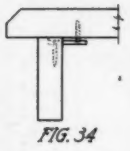


FIG. 34

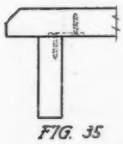


FIG. 35

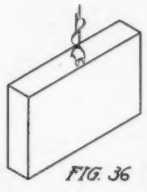


FIG. 36

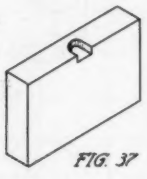


FIG. 37

2. Figures 34 and 35 show how the top may be fastened into place.

3. Figure 36 suggests a method of boring a hole for placing the fastener, the diameter of the bit must be equal to the width of the metal fastener.

4. Figure 37 shows the recessed cut ready for the fastener to be put in place.

Since metal fasteners may be bought in a number of different sizes, the writer did not attempt to give dimensions for them.

Associations, Conventions

BOSTON VOCATIONAL SOCIETY HOLDS NOVEMBER MEETING

The Vocational Education Society of Boston held its regular monthly meeting on Saturday, November 19, at the L Street plant of the Edison Electric Illuminating Company.

This plant is the oldest unit of this great system and one in which the most modern scientific advances may be seen side by side with the old equipment that is still in use. It offers a fine opportunity to see the evolution through which electric power generation and distribution has gone.

An executive of the company explained the changes necessary to carry out the plans of the company to have all electric wires placed underground. Samples of the insulation necessary for such underground construction were shown. — *Louis A. Van Ham.*

WESTERN ARTS ASSOCIATION TO MEET AT COLUMBUS

The Western Arts Association will hold its twenty-ninth meeting May 3 to 6, at Columbus, Ohio. President William E. Warner will preside.

The topic for discussion at the meeting will be "The Primacy of the Arts."

"Education Through the Museums" will be discussed by Ann V. Horton, Cleveland, Ohio; "Art and the Child" will be taken by Mr. Dudley Crafts Watson, of the Art Institute of Chicago; "Art for Beauty" by Mr. Watson, will be a music-picture symphony; "Children's Creations in Pottery" will be the topic of Miss Myrtle M. French, of the Art Institute of Chicago; "Decorative Processes in Pottery" will be taken up by Mr. Arthur E. Baggs; "Ceramics in the Public Schools" will be handled by Frederick Clayter, Carnegie Institute, Pittsburgh, Pa.; "The Derivation of the Drawing Content" will be discussed by Otto A. Hankammer; "The Drawing Room of the Future" will be taken by Glenn L. Roberts of Ohio University; "Industrial-Arts Objectives" by Geo. C. Decker; "The Shop Teacher and His Profession" by R. W. Selvidge, University of Missouri; "Research of the Federated Council on Art Education" by Royal Bailey Farnum; "Research in Art Education" by Thomas Munro, Cleveland Museum of Art; "Historical Research in Industrial Arts" by Charles A. Bennett, Peoria, Ill.

SCHOOL CRAFTS CLUB INSTALLS OFFICERS

The regular meeting of the School Crafts Club of New York was held Saturday evening November 19, 1932, at the Y. M. C. A. West 63rd St., New York City. Approximately 30 members attended.

Mr. Arthur F. Hopper, supervisor of industrial arts of Plainfield, N. J., was the principal speaker. His topic, "The Old and New in Industrial Arts Education," proved to be a source of stimulation as well as being interesting. He commented upon the significance and importance of the type of education boys (and girls too) get in a true industrial "arts" shop, especially as this education helps the child to orient himself in our present complex mechanized civilization. The cultural and broadening values of general-shop experiences were also stressed. Mr. Hopper also pointed out that the present condition of economic stress placed upon the industrial arts the necessity of justifying its position in the educational organization; that since school budgets are being scrutinized with the idea of effecting economies it is necessary for each teacher and supervisor to be ready to show the public and other school people the vital influence the industrial arts have in providing true education and giving the child opportunity for experiences comparable to those found in life. Closer correlation with other school subjects was stressed as vital. The talk was concluded with the practical suggestion that the industrial-arts teachers should go more than half way in fraternizing with the other members of the faculty of the school in which they are teaching; that much of value can be accomplished from the free intermingling of the ideas of the academic teachers and those of the industrial-arts teacher.

The officers for the year 1932 – 33 were installed at this meeting and are as follows: David Petrie, Paterson, N. J., president; C. Dudley Moore, Glen Ridge, N. J., vice-president; Harry Fletcher, Woodside, N. Y., treasurer; William G. Fiedler, Union City, N. J., secretary; Norman A. Crow, Paterson, N. J., financial secretary; Arnold Hess, Seabright, N. J., chairman program committee; Lawrence J. Hemming, Jackson Heights, N. Y., chairman entertainment committee; Milton I. Jacobi, Brooklyn, N. Y., chairman membership committee; John W. Seeley, Union City, N. J., chairman publicity committee.

The next meeting will be held on January 3, 1933, it being decided to omit the December meeting due to the holiday season. — *John W. Seeley.*

THE PEORIA INDUSTRIAL EDUCATION CLUB MEETING

The monthly dinner meeting of the Peoria Industrial Education Club was held November 24, at the Westminster Presbyterian Church, Peoria, Ill. Twenty-nine members were present at the six o'clock dinner.

The speaker of the evening, Dr. Clinton L. Scott, of the Universalist Church, Peoria, talked on "Industrial Conditions in Russia." He gave some interesting statistics on Russia, describing the five-year plan and its present operation. He pointed out that the Russian workman is only 60 per cent as efficient as the American workman. Literacy has been raised from 20 to 40 per cent in five years.

Mr. J. C. Gamback, of the Peoria High School, gave a brief account of the meeting of the drafting division of the I. V. A. at Chicago. Mr. L. P. Elliot, supervisor of industrial education in Peoria, gave some sidelights on the Chicago convention of the I. V. A. — *F. L. Barloga.*

WISCONSIN INDUSTRIAL-ARTS ASSOCIATION MEETS IN MILWAUKEE

The Wisconsin Industrial-Arts Association held its anual meeting November 4, in the Loraine Room of the Hotel Schroeder, Milwaukee, Wis., with president L. F. Stacker, presiding.

Following the reading of the minutes of the previous meeting, the reports of the committees were received. Mr. R. R. Van Duzee presented the financial report for the year.

Probably the most important item of interest was the proposal of Mr. Waddell to organize the state into conference groups. The executive committee accepted the proposal and has begun work on a plan for the organization of conference groups so that all sections of the state will be covered.

President Stacker brought up the matter of a change in the constitution and by-laws to conform to a plan of extending the state organization into every part of the state through the opera-

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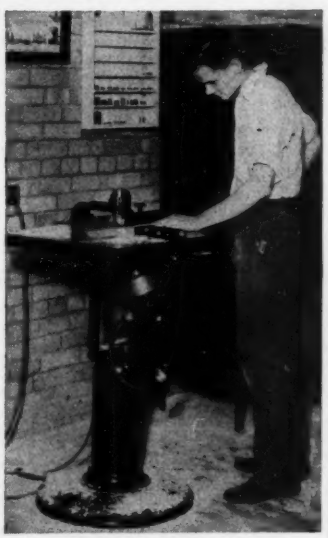
Overhead Hold-Down holds the work to the table and eliminates vibration.

The Carter Tilting Spindle allows the use of small standard cutters which means greater savings and safety.



Motor 3 H. P. Speed 15800 R. P. M.

Small molding can be run in safety.

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THE R. L. CARTER COMPANY
111 Elm Street, New Britain, Conn.

Experience
is a great teacher

After school this young fellow spends a few profitable hours in the basement of his home where his parents have installed a small workshop. Experience with tools has taught him a great deal. It trains his mind to think clearly for he must work his problems without help. He learns to create things of beauty with his hands. And creating things by himself gives him greater respect for the work of others. In school he is more alert than his classmates. He is quicker to grasp an idea and he usually can work it out by himself.

Many students could do no better than to have a small workshop at home. Why not suggest it. A few inexpensive Driver tools are within the reach of nearly everyone. And they mean so very much to a boy.

WALKER-TURNER CO., Inc.

To acquaint your students with the possibilities of owning their own workshops let us send you enough booklets describing the various Driver workshop tools and their uses to distribute to your students. There's no obligation on your part. Simply specify the number you require.

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I think my students would be glad to have free copies of the booklet mentioned. I can use .....

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tion of regional groups. After discussion, it was voted to appoint a committee to work on the constitution so that it may form a guide for the new plans of the association.

A motion was made and carried that Dr. Bawden's talk before the Association in November be published in the *Wisconsin Journal of Education*.

New Publications

How to Make Veneered Panels for the School and Home Workshop

By Herman Hjorth. Cloth, 96 pages, 6⅛ by 9¼, illustrated. Published by The Casein Manufacturing Company of America, Inc., New York City.

Mr. Hjorth has succeeded in condensing into this small volume a wealth of information on veneering. The book covers the history of veneering, enumerates its advantages, describes methods of producing the various kinds of veneers, describes the different types, gives a very good description of different kinds of glues, describes how to prepare the core and the crossbands, shows how to prepare face veneers for gluing, describes the veneer press, how curved work is veneered, and how metal and other materials are used in veneering. It also describes veneering defects, how to prepare veneered work for finishing, contains a chapter on wood finishing, and shows a number of projects for which veneers may be used.

Craft Problems and Reference Book for Lathers and Plasterers

By Harry J. Hagen. Cloth, 170 pages, 6⅛ by 9¼, illustrated. Price, $2. Published by Craft Problems Distributors, 4005 Lexington Ave., St. Louis, Mo.

This book contains a great deal of interesting information which will be of practical value to the apprentice and journeyman lather and plasterer.

Examples in Plane Trigonometry

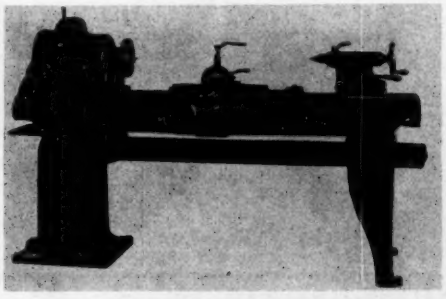
By Winfield M. Sides. Cloth, 79 pages, 5⅛ by 7⅝. Price, 70 cents. Published by McGraw-Hill Book Company, Inc., New York City.

This book presents a large number of trigonometric problems covering a very wide field.

SchoolShopEquipmentNews

LEBLOND SUPER REGAL ENGINE LATHE

The LeBlond Machine Tool Company, Cincinnati, Ohio, announces the marketing of its new simplified Super Regal engine lathe, a revolutionary type of lathe, embodying new safety features, simple control, and automatic lubrication.

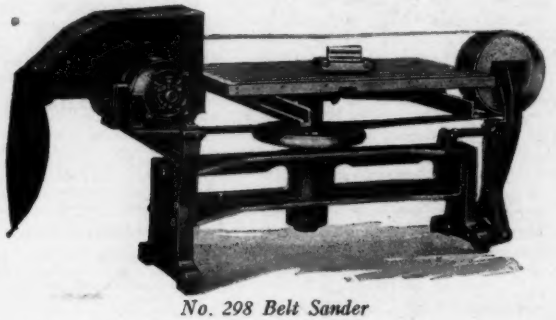


Super Regal Engine Lathe

This lathe has eight speed changes. All gears are of steel. The motor is within easy reach of the operator, and the apron is of the double-walled one-piece type with all running parts operating in oil, or oiled by a plunger pump. The motor is mounted in a hinged plate on the rear of the leg, in such a position that it requires no extra floor space and is practically free of floor dust and any tendency to vibrate. The Super Regal is available in sizes of 12 and 14 inches in any bed length desired.

NEW OLIVER NO. 298 BELT SANDER

The new self-contained belt sander No. 298, just placed on the market by the Oliver Machinery Company, Grand Rapids, Mich., occupies minimum floor space and is much cheaper than one of the larger sanders.



No. 298 Belt Sander

It is directly motorized, and is large enough to take care of the ordinary run of work handled in the school shop. It is capable of handling pieces 46 in. long, 26 in. wide, and 9 in. high, and contains all of the features of the most advanced belt sanders. One of its features is the dust-collecting bag which makes it unnecessary to install an exhaust system.

The sand-belt pulleys are 14 in. in diameter, with a 5 in. face. They are made of aluminum, carefully balanced, and faced with rubber. The idler runs on ball bearings, has an automatic spring take-up, and a micrometer screw adjustment for tracking the belt.

A 1 h.p., ball bearing, 3 phase, 60 cycle, 220 volt motor, running at 1800 r.p.m., is mounted on the frame of the machine and is fitted with a special safety switch and wiring for use when power lines are connected.

The machine has a total length of 7 ft. 2 in., and a width of 3 ft. 8 in.

NEW COMBINATION RUBBER AND FRICTION TAPE

The B. F. Goodrich Company, Akron, Ohio, has recently placed on the market a new combination rubber tape and friction tape which will be welcomed by electricians and contractors.

The tape has been thoroughly tested in all kinds of electrical work. It is made of fabric, completely imbedded in a unique rubber compound with a high degree of adhesion. The joint is wrapped only once, but the wrapping is practically as permanent as the original insulation on the wire. It possesses great strength; is waterproof; resists heat, cold, and abrasive wear; is clean to handle; does not unravel; is sold at low cost; and does not dry out.

A copy of the descriptive bulletin will be sent to any shop instructor.

ANNOUNCE NEW STARRETT CATALOG

The L. S. Starrett Company, Athol, Mass., has just issued a new 28-page supplemental catalog, illustrating and describing its line of tools, which include tap wrenches, clamps, calipers, steel-beam trammels, levels, gauges, prick punches, hack saws, and steel blades.

A copy of this catalog may be obtained upon request.

HENSHAW CHANGES ADDRESS

The R. M. Henshaw Company, formerly at 250 Stuart St., Boston, Mass., has announced that it has obtained a new location at 221 Columbus Ave., Boston, Mass. The new location affords improved warehouse facilities.

MORSE TWIST DRILL COMPANY ESTABLISHES WAREHOUSE

The Morse Twist Drill & Machine Company, New Bedford, Mass., has announced the opening of a warehouse at 750 West Randolph St., Chicago, Ill., where it maintains a complete stock of high-speed and carbon drills, reamers, taps, dies, and milling cutters.

TRACING SUPPLEMENT, No. 257, JANUARY, 1933
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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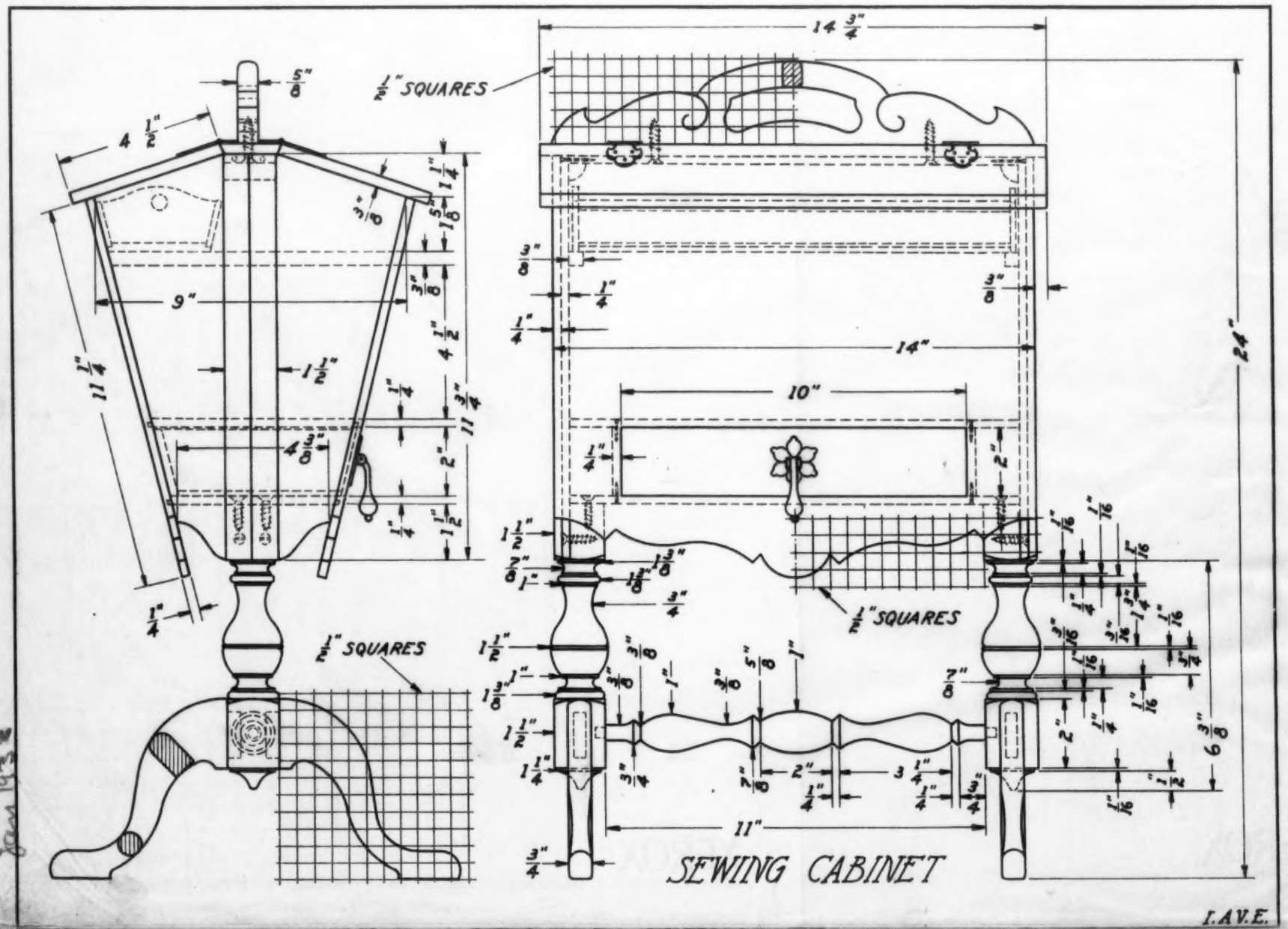

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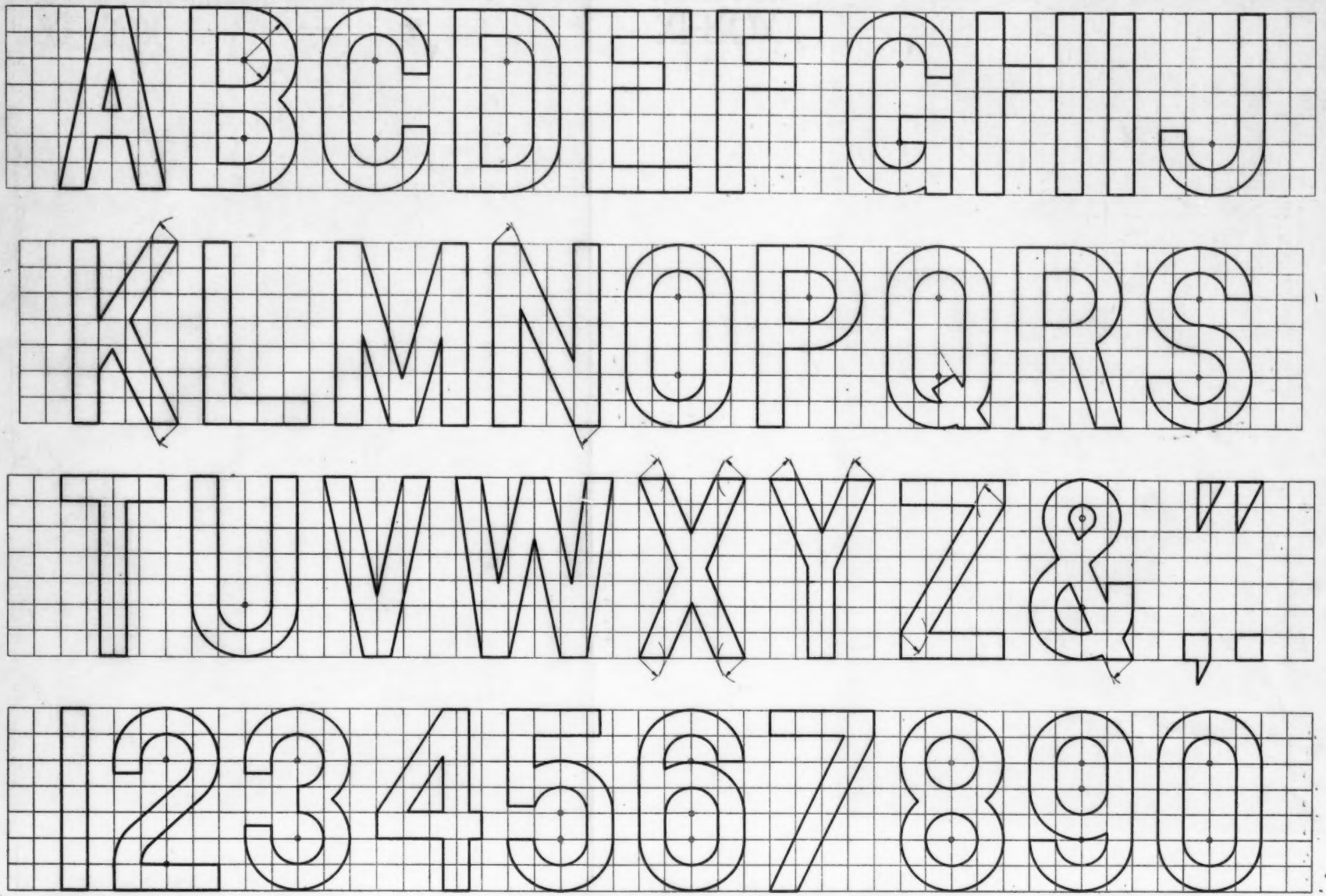

Block Letter Alphabet, Designed by Peter Dillman, Milwaukee, Wis.

INTRODUCTION

IN THESE times when our inheritances from the past are no longer able to satisfy the conditions of the present, when changes in our social, economic, and educational life are imperatively necessary, the services of a book like BRUCE'S SCHOOL SHOP ANNUAL are more than ever needed, so that shop teachers, supervisors of industrial arts and vocational education, and school administrators may have access to organized material which will assist them in making those alterations which our present civilization makes so urgently necessary.

In order to give the greatest number of those engaged in industrial arts and vocational education access to the subject matter which goes to make up the ANNUAL, it was decided to combine the sixth edition of this book with the February issue of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION Magazine.

The content of the joint publication was chosen with extreme care, and it is hoped that every objective for which the two publications were originally projected has been fully met. Those who are primarily interested in the offerings of the ANNUAL will find in this sixth edition the same type of material that has earned such widespread and enthusiastic acceptance for the five preceding editions.

They will be interested in the description of what Everett, Washington, and Peoria, Illinois, offer to their students in the fields of industrial arts and vocational education. They also will welcome the article on School Lighting which has been specially written for the ANNUAL by a lighting engineer. Besides the articles just mentioned, there are others on the content of shop subjects, methods of teaching, types of industrial material, shop layouts, and kindred subjects.

Carefully revised checking lists, covering the major equipment, small tools, materials, and supplies in the school shop, also have been made part of the ANNUAL. These maximum lists will be found helpful in checking inventories and preparing budgets.

The reader of the Magazine who is especially interested in problems and projects will find that he has not been slighted. In other words, both the ANNUAL and the Magazine have found adequate representation in this, the 1933 SCHOOL SHOP ANNUAL number of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION Magazine.

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Textbook Features, Including Useful Instructions Covering Methods and Processes

MANY months of preparation have been given to this catalog by experienced special ists in order that its contents might include authoritative information and sugges tions of daily usefulness to Teachers of the Metal Arts, Block Printing, etc.

The book is profusely illustrated and tools and appliances are clearly pictured and described.

The method of compiling provides for descriptions of tools and their uses in greater detail than is commonly employed.

The tools displayed are those whose right to preference has been long established, together with new and improved models evolved out of the experience of practical craftsmen.

To Teachers or School Purchasing Departments the Book will be sent FREE. To others, a charge of $1.00 will be made. This will be credited against any initial purchase of $5.00 or more, made within one year.

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